SupraModem™ 2400 plus

Also covers
SupraModem 2400 MNP

Supra Corporation

INTRODUCTION

Congratulations on purchasing a **SupraModem 2400 MNP™** or **SupraModem 2400 Plus™**! Your new modem provides the excellent price and performance features that have made SupraModems so popular, and we're very sure that it will bring you many years of exciting, productive telecommunications.

Features

Like the original SupraModem 2400™, your modem is fully compatible with the industry-standard "**AT**" command set and transmits data at 300, 1200, and 2400 bits per second (bps). It offers automatic answering and dialing (both pulse and tone) and has 2 modular phone jacks — 1 for the telephone line and 1 for an optional phone. Your modem also includes a programmable nonvolatile memory that stores up to 4 telephone numbers and 2 custom configuration profiles.

But some of the greatest benefits of the SupraModem 2400 MNP and SupraModem 2400 Plus come from their sophisticated data compression and error correction protocols:

- The **SupraModem 2400 MNP** features both Microcom Networking Protocol (MNP™) levels 2 through 4 error correction *and* **MNP 5** data compression. These protocols give you up to 4800 bps, error-free throughput when connected to another MNP 5 modem.
- The **SupraModem 2400 Plus** features **CCITT V.42bis+**, which includes MNP 2-4 and Link Access Procedure M (LAPM) error correction, and MNP 5 and British Telecom Lempel-Ziv (BTLZ) data compression. These protocols can give you up to 9600 bps, error-free throughput when connected to another V.42bis modem.

With these protocols at your disposal, you can simply set up your modem once and then mostly forget about communication rates and protocols. The SupraModem will automatically determine what kind of modem is at the other end of the phone line — CCITT V.42bis, V.42, MNP, 2400, 1200, or 300 bps — and then adjust its rate and protocol for optimal communication with the other modem.

About This Manual

This manual explains internal and external versions of both the SupraModem 2400 MNP and the SupraModem 2400 Plus. It is designed to answer any questions you have about your SupraModem, but you should not need to read all of it!

We have included lots of technical details for those who want to know about the inner workings of their modem. But for most of you, Chapter 1 should be enough to get you online quickly and directed toward specific information throughout the manual.

Now, go have fun with your new modem!

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1

GETTING STARTED

This chapter summarizes everything you need to know to use your modem and tells you when you need to use other parts of this manual. It is divided into three parts:

- **Setting Up Your Modem**
- **Going Online**
- **Where to Go From Here**

Setting Up Your Modem

1. **Gather everything you need:**

   - **Your SupraModem** and everything it came with. The following items should be in your SupraModem package:
     - SupraModem 2400 MNP or SupraModem 2400 Plus
     - *SupraModem 2400 MNP/Plus Operator's Manual*
     - *SupraModem 2400 MNP/Plus Reference Card*
     - phone cable
     - warranty registration card
     - power adapter (for external modems only)
     - software and manual (only if you purchased the modem packaged with software)
   - **Telecommunications software** (if you purchased the modem without software). Software is available from computer dealers and computer user groups.
   - **A cable for connecting your modem to your computer** (if you have an external modem). For maximum performance, THIS CABLE MUST SUPPORT RTS/CTS HARDWARE HANDSHAKING. If you need help determining what type of cable to get, please refer to Appendix E or contact your computer dealer for assistance.
   - **Telephone number** of the modem(s) you plan to connect to. The remote modem may be part of a Bulletin Board System (BBS), network (such as CompuServe™), business, school or other system. If you have a choice of phone numbers for the same system, choose one that supports MNP 5 or V.42bis 2400 bps connections. If you're new to telecommunications, you may find that the special offers included with your SupraModem are a good place to start.
   - **Word length, parity, and stop bits** for the remote modem. The most common settings are 8 data bits per character (word length), No parity, and 1 stop bit. If you are not sure what settings to use, consult the manual for the online service you are calling, or contact the remote computer's operator. You can set these parameters in your telecommunications software.
   - A **modular telephone line jack** to plug your modem's phone cable into. If you don't have a modular jack, contact your telephone company or computer dealer for assistance.

2. **Install your modem.** Chapter 2 provides instructions for installing both external and internal SupraModems.

3. **Install your telecommunications software** as described in the software manual.

4. **Set your computer rate to 9600 bps & turn on flow control** (sometimes called RTS/CTS hardware handshaking). Use your software to do this. Setting your computer to 9600 bps allows your modem to make the fastest possible connection. Flow control lets you take full advantage of data compression.
   Note: If your software does not let you turn flow control on and off, set your computer rate to 9600 bps and go on to step 5.

5. **Configure your modem for MNP and/or V.42bis operation.** SupraModems are preset at the factory for MNP/V.42bis. *Unless you use a Macintosh™ computer, you can skip this step.*

   If you use a Macintosh, issue the following commands. (**[CR]** indicates a carriage return is required.)

   AT &F2 &D &W [CR]

   Read your software manual to determine if you should put these commands in your software's "modem initialization string" or if you should type the commands while in your software's "terminal mode." (If you put the commands in the initialization string, you can omit the **&W** command.) Chapter 3 explains terminal mode.

   If you have problems or want more information, refer to Chapter 3 on commands, Chapter 4 on MNP/V.42bis, Chapter 6 on stored configurations, or Chapter 9 on solving problems.

Now you're ready to use your modem to call another computer.

Going Online

You'll do the following EACH TIME YOU MAKE A CALL.

1. **Dial** the number of the modem you want to connect to, using your software as explained in the software manual. Your software will issue the modem dial command, which is explained in Chapter 5. You can also issue the dial command manually (from your software's terminal mode, which Chapter 3 explains). The most common form of the dial command is **AT DT 555-5555 [CR]**, which tells your modem to "tone" dial the number "555-5555."

2. **Watch for a connection**. After your modem connects to the remote modem, your modem will send your software a "result code." Then your software will either display the exact modem result code, or it will interpret that result code and send you a message of its own to indicate a connection has been made. (Appendix B and the quick-reference card explain result codes.)

   If the message your software sends does not tell you what type of connection you've made, and you have an external modem, check the modem indicator lights.

   - If the **MNP** light is on, MNP error correction is being used.
   - If the **LAP** light is on, LAPM error correction is being used.
   - If the **DC** light is on, MNP 5 or BTLZ data compression is being used.
   - If the **HS** light is on, the modems are connected at 2400 bps.

3. **"Log on"** to the remote computer. For information on how to do this, refer to the manuals that came with the service you're using (such as the *CompuServe User's Guide*) or contact the remote computer's operator (for example, if you're dialing your office or school computer).

4. **Communicate online.** Now you can browse through directories, read and transfer files, read and send mail, and whatever else the computer you've called allows you to do.

5. **"Log off" and hang up.** When you're done, "log off" of the remote computer (as explained by the remote computer's manual or operator) and then tell your software to hang up.

Alternately, after logging off you can do the following to tell the modem to hang up:

a. Wait 1 second after communicating online.

b. Quickly type 3 plus signs (+++). (This is the "escape code." It puts your modem in "command state" so what you type goes to your modem instead of to the remote computer.)

b. Watch for the **OK** result code, which appears after 1 second.

c. Type **ATH** and then press the carriage return key.

d. Watch for the **OK** result code and, if you have an external modem, for the **CD** and **OH** lights to go off.

Congratulations! You've just completed your first online session!

Where to Go From Here

Now you know the basics of modem operation. Because your software will perform most telecommunication tasks for you, you shouldn't need to know too much more about your modem to get maximum performance. But to answer any questions you may have and help you accomplish whatever you need to do with your modem, we have filled the next hundred pages with reference and problem-solving information to help you if you need it.

You should read more of this manual IF:

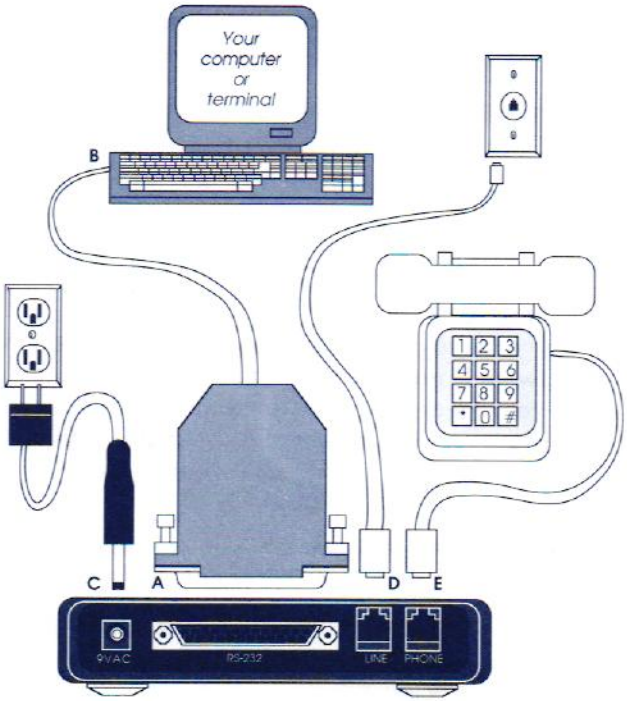
- **You are having problems with the modem.** Chapter 9 will be particularly helpful.
- **You are confused by terminology.** Consult the glossary.
- **You want to know more about data compression/error correction.** Refer to Chapter 4.
- **You need to configure the modem for something that your software is not able to do.** For example, you may want to set up your modem for auto answer. Some telecommunications software can do this, but other software cannot. Consult your software manual to find out if your software can do what you want done.
- **Your software requires that you reconfigure your modem.** *Most software does NOT require this.* Refer to Chapter 6.
- **You are setting up a Bulletin Board System (BBS).**
- **You simply want a better understanding of how your modem works.**

2

INSTALLING YOUR MODEM

Connecting an External SupraModem

1. Make sure your computer is turned off.
2. Insert the male end of the RS-232C cable into the plug (A) on the back of the SupraModem. Then insert the other end (B) into your computer's serial port.
3. Plug the power adapter (C) into the SupraModem socket labeled **9VAC**. Then plug the power adapter into a wall socket.

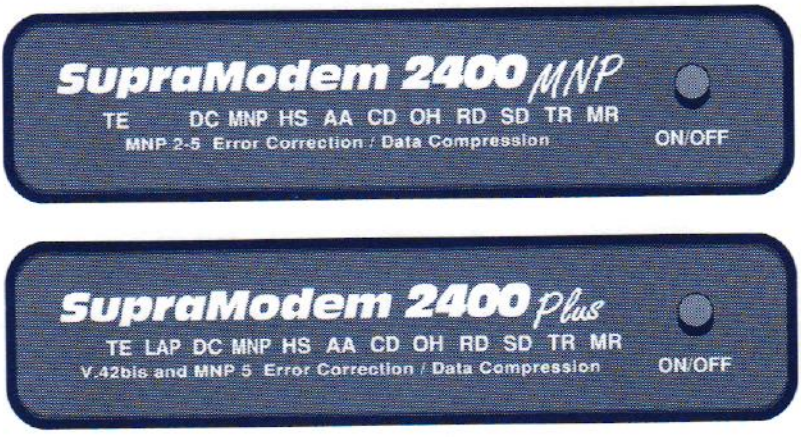


4. Plug one end of the telephone cable provided with your modem into the socket labeled **LINE** (D) on the back of the modem. Then plug the other end into a modular telephone wall jack.
5. You can also connect an optional telephone to your modem by connecting the phone's modular plug to the **PHONE** (E) socket on the modem back. This allows normal telephone voice communication when your modem is not in use.
6. Turn your computer on.
7. Turn your modem on by pressing the **ON/OFF** button on the front of the modem. Your modem is now installed.

IBM PC, XT, AT, and compatible users only: When you install your software, you might need to give it your serial port's COM number, to tell the software which COM port the modem is plugged into. Refer to your computer documentation to get this information.

External SupraModem Indicator Lights

The lights on the front of the modem report the modem's status:


SupraModem 2400 MNP
TE DC MNP HS AA CD OH RD SD TR MR
MNP 2-5 Error Correction / Data Compression
ON/OFF
SupraModem 2400 Plus
TE LAP DC MNP HS AA CD OH RD SD TR MR
V.42bis and MNP 5 Error Correction / Data Compression
ON/OFF

TE (Transmission Error). When lit, indicates the modem's MNP or LAPM protocol has detected and corrected a transmission error. This light stays on for 1 second after each error. (If this light comes on frequently, you may want to hang up and redial, to try to get a better telephone connection.)

LAP (Link Access Procedure). On the SupraModem 2400 Plus, indicates the modem is using LAPM error correction.

DC (Data Compression). On the SupraModem 2400 MNP, indicates the modem is using MNP class 5 data compression (the MNP light will also be on). On the SupraModem 2400 Plus, indicates the modem is using either MNP 5 data compression (if the MNP light is on) or BTLZ data compression (if the LAP light is on).

MNP (Microcom Networking Protocol). When lit, indicates the modem is using MNP classes 2-4 error correction. If the DC light is also on, the modem is also using MNP 5 data compression.

HS (High Speed). When lit, indicates the connection rate is 2400 bps.

AA (Auto Answer). When auto answer is enabled, comes on to indicate the modem is ready to answer calls. Also, always flashes during the ring signal of incoming calls.

CD (Carrier Detect). When lit, indicates the SupraModem has locked onto a valid data carrier signal from the remote modem. In other words, your modem has successfully connected to the modem at the other end of the telephone line.

OH (Off Hook). When lit, indicates the modem is "off-hook" (equivalent to lifting the telephone receiver off its cradle).

RD (Receive Data). Flashes on and off quickly when data is being sent from the SupraModem to your computer. This indicator may appear to be lit continuously because it flashes on and off so quickly.

SD (Send Data). Flashes on and off quickly when data is being sent from your computer to the SupraModem. This indicator may appear to be lit continuously because it flashes on and off so quickly.

TR (Terminal Ready). When lit, indicates your computer is ready to communicate with your modem. The **TR** light follows the status of the DTR line.

MR (Modem Ready). When lit, indicates the modem is ready to communicate. When blinking, indicates a test is in progress. When off, indicates the modem is turned off or has a problem.

Installing an Internal SupraModem in an IBM PC, XT, AT, or Compatible

Do You Need to Change Your COM Port or IRQ?

When shipped, internal SupraModems are set to use COM port 3 (COM3) and interrupt request 4 (IRQ4).

You need to change your modem's COM port setting if:

- your telecommunications software cannot address COM3 *or*
- your computer uses a mouse on COM1 or 3 *or*
- you have another device that you want to use on COM3

You need to change your modem's interrupt request if:

- you have another device that already uses IRQ4 *or*
- you have changed your COM port setting.

Telecommunications Software

If you plan to use telecommunications software other than the software shipped with your SupraModem, you need to make sure the software you're using can address the COM port you're using. Most popular programs, including the one included with your SupraModem, are able to address COM ports 1–4.

Telecommunications Software and A Mouse

If you plan to use telecommunications software that uses a mouse, you might need to change your COM port setting as follows. If the mouse is on COM1 or COM3, the modem can only use COM2 or COM4. If the mouse is on COM2 or COM4, the modem can only use COM1 or COM3.

Other Devices

Because of the IBM PC's architecture, the modem cannot be on the same COM port or interrupt as any other device being used. Some other devices that might cause a problem include a serial or bus mouse, digitizer, networking card, or serial card. If you have one or more of these devices and you don't know which COM ports and interrupts they use, contact your computer dealer for assistance.

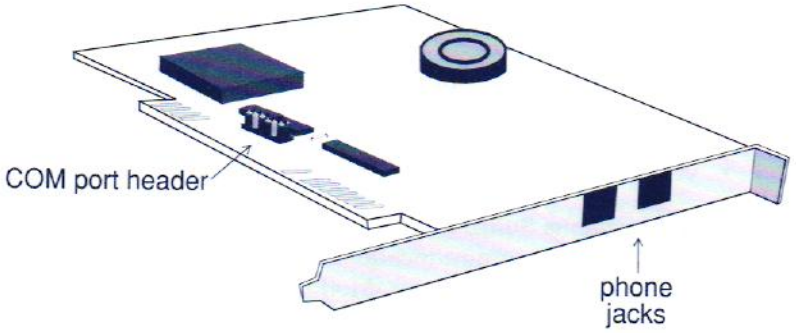
Changing IRQ Setting to Match COM Port Setting

If you change the modem's COM port setting, you must also change the IRQ setting as shown in the table on the following page, but first note the caution at the top of the next page.

Caution: Do not use IRQ2 or 5 unless you're an expert and know what you're doing. Because of variations between computers and the different ways they handle these interrupt requests, Supra Technical Support cannot provide assistance with using IRQ2 or 5. Please contact your computer dealer for further assistance.

How to Set the COM Port and IRQ

To set the COM port and IRQ, you'll move "jumpers" on "headers" on the modem. The illustration below shows the location of the header used to change the COM port setting.



Where to Place the Jumpers

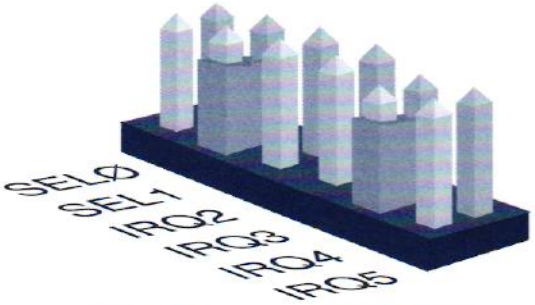
The COM port header into SEL (used to set the COM port) and IRQ (used to set the IRQ). To set the COM port, move the jumpers as shown below. To set the IRQ, place a jumper next to the appropriate label (IRQ2, IRQ3, IRQ4, or IRQ5), as shown below. You may want to use needle nose pliers to lift and move the jumper.

	To set the modem to use:			
	COM1	**COM2**	**COM3**	**COM4**
Set SELØ to:	—	jumper	—	jumper
Set SEL1 to:	—	—	jumper	jumper
Set IRQ to:	IRQ4	IRQ3	IRQ4	IRQ3

Save any left over jumpers for possible future use. One easy way to save one is to place it over only one pin on a header, so that no connection is made.

Example of Placing the Jumpers

If the jumpers on the COM port header are placed as shown below, your modem is set to use COM3 and the interrupt request is set to IRQ4.



COM port header set to COM3 & IRQ4

How to Set the Base Address

If your software asks you for the "base address" corresponding to your COM port and interrupt request, provide the appropriate number from the table below. If your software doesn't ask for a base address, don't worry about it!

COM	IRQ	Base Address
1	4	03F8
2	3	02F8
3	4	03E8
4	3	02E8

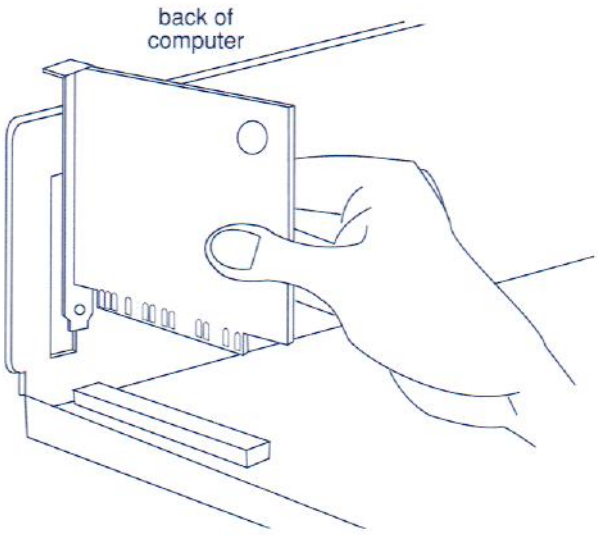
Installing Your Modem

Because PCs and compatibles come with various board layouts, you may need to vary this procedure slightly for your computer. If you need assistance, please refer to your computer's manual.

1. Turn off your computer and unplug its power cable.

   Warning: If you do not, you may hurt yourself and/or damage your equipment.

2. Remove the computer's top according to instructions in the computer's manual.
3. Locate the computer's system expansion slots and decide which slot to place the modem in. The modem will fit in any short or long slot.
4. At the back of the computer are metal brackets that cover holes in the computer case that correspond to the computer's expansion slots. Find the metal bracket that corresponds to the expansion slot you plan to use. Then remove the screw that holds the metal bracket in place, remove the bracket, and save the screw.
5. Hold the modem over the expansion slot as shown below, with the modem's metal bracket and phone jacks toward the back of the computer, and the modem's gold edge connector pointed down. Place the modem into the expansion slot and push it down so it is firmly seated.



6. Use the screw you removed in step 4 to attach the modem's metal bracket to the computer.
7. Replace the computer's top.
8. Plug one end of the supplied telephone cable into one of the modem telephone jacks, and plug the other end into a wall telephone jack.
9. *Optional* If you want to connect a telephone to the same telephone line as the modem, plug the telephone's cable into the remaining modem telephone jack. ***Note:*** The telephone cannot be used while the modem is being used.
10. Plug the computer's power cable into an electrical outlet. The modem will turn on automatically when you turn on your computer.

3

USING AT COMMANDS & RESULT CODES

When you tell your telecommunications software to perform a task (such as dialing a phone number), it uses the SupraModem's **AT** commands to perform the task. It is usually easier to let your telecommunications software issue the commands for you than it is to issue the **AT** commands yourself.

When your telecommunications software can't perform a task (or you don't want it to), you'll issue the **AT** commands yourself. These commands can be used to perform various tasks, from hanging up to changing your modem's speaker volume.

Various chapters in this manual explain how to use the Supra Modem **AT** commands to accomplish specific tasks. The rest of this chapter explains how the **AT** commands work, and Appendix A describes each command in detail.

Issuing Commands Yourself (Terminal Mode)

To issue **AT** commands yourself, you must be in your software's "terminal mode" — also called "direct connect" or "local" mode. In this mode, the commands you type go to the modem rather than to your software or the remote computer.

Some software is in terminal mode as soon as you start the program. If the modem responds with the **OK** result code when you type the following, you are in terminal mode and ready to issue commands (**[CR]** represents a carriage return):

AT [CR]

If you are not in terminal mode, refer to your software manual to determine how to get there.

Command State & Online State

The SupraModem has two states: command and online.

- Whenever you first turn the modem on, it is in command state. It MUST be in command state for **AT** commands to be issued.
- When the SupraModem connects to another modem, it automatically changes to online state. The modem MUST be in online state for data to be transmitted.

If you're connected to a network, Bulletin Board Bystem, or other remote computer (i.e. you're online) you can transmit data, but you must change to command state to send **AT** commands.

To switch from one state to the other, use the methods below.

- To switch from online state to command state, type the escape code (**+++**) as explained below. This automatically puts you in terminal mode, ready to type commands.
- To switch from command state to online state, issue the **O** (on-line), **A** (answer), or **D** (dial) command (in other words, answer a call or dial a number). The **O**, **A**, and **D** commands are described in Appendix A.

Escape Code (+++)

The escape code is a string of three ASCII plus signs (**+++**) preceded and followed by a "guard time" during which no other data is transmitted. It is used to leave online state without hanging up. To use it, do the following:

1. Do not transmit any data for a period equal to the guard time. The default setting for the guard time is 1 second.
2. Type the escape code quickly. Do not follow with a carriage return.
3. Do not transmit any data for another period of time equal to the guard time.

The modem responds to these steps with the **OK** result code. If it doesn't, either it received data during the guard time or the escape code was typed too slowly. The time between each plus sign ('+') in the escape code should not exceed the guard time. The plus signs in the escape code can be changed to another ASCII character by changing the value in register **S2**.

Command Line Syntax

SupraModem commands must comply with these syntax rules:

- The prefix **AT** must precede all commands except **A/** and be in all uppercase (**AT**) or all lowercase (**at**) characters. The **AT** signals the beginning of a command line and "gets the modem's attention." The SupraModem examines the **AT** code to determine your computer's rate, parity, word length, and number of stop bits. The SupraModem then stores your current configuration in its RAM memory. You can choose to save these settings in the SupraModem's nonvolatile memory by issuing the **&W** command.
- Multiple commands can appear on one command line. You can separate these with spaces to improve readability (the modem's command interpreter ignores the spaces).
- Each command line (except **A/**) must end with a carriage return (**[CR]** — ASCII 13) unless you configure the modem to accept a substitute. If you don't provide a carriage return, the modem ignores the line.
- A line feed character following the carriage return is optional and is ignored by the modem.

The following are examples of valid command lines:

AT D T 555-5055 [CR]

ATH [CR]

AT &F &C1 &D2 &W [CR]

A/

Note that the **A/** command is neither preceded by **AT** nor followed by a carriage return.

Command Line Buffer

The modem places each command you type into a command buffer that holds up to 40 characters. The modem does not place the **AT**, carriage return, line feed characters, or spaces into the buffer, so the buffer's 40 spaces only hold characters from actual commands. If a command line contains more than 40 command characters, the modem ignores the commands and displays the **ERROR** result code when it receives the command line's carriage return.

The buffer stores the last command line it received until it receives another command line or the modem is switched from the command state to the online state. Because it remembers this last command line, you can re-execute that command line by issuing the **A/** command. (Remember, the **A/** should not be preceded by the **AT** prefix or followed by a carriage return.)

Result Codes

After the modem receives a command, it responds by returning a result code. The most common result code is **OK**, which means the modem understood your command. Other result codes, their numeric forms, and their meanings are listed in Appendix B.

Result codes can be represented by English words or with numbers. Word result codes are preceded and followed by carriage return and line feed characters. Number result codes are followed by a carriage return.

4

MNP, V.42bis, & Flow Control

Start with the Basics

To understand the rest of this chapter, you need to understand these basic ideas:

- The SupraModem 2400 MNP supports MNP classes 2, 3, 4, and 5. The most important are **MNP 4** , which corrects data transmission errors, and **MNP 5**, which compresses data up to 2:1, doubling "throughput."
- The SupraModem 2400 Plus supports CCITT V.42bis+, which includes **MNP 2-4** and **LAPM** error correction, and **MNP 5** and **BTLZ** data compression. MNP 5 compresses data up to 2:1 (maximum throughput 4800 bps), and BTLZ compresses data up to 4:1 (maximum throughput 9600 bps).
- "Throughput" is the effective transfer rate. Generally speaking, on a 2400 bps connection, data will transfer at a maximum of 2400 bps, meaning maximum throughput is 240 characters per second. But on a 2400 bps MNP 5 connection, where MNP 5 can compress the data to half its original size, throughput can be double that of the 2400 bps connection without MNP 5, or 480 characters per second. The connection rate and actual transmission speed are still only 2400 bps.
- "Remote Modem" is the modem your modem connects to over the phone line.
- Both your modem and the remote modem must support the same data compression/error correction protocols. If the other modem does not support the same protocols that your modem supports, you can connect and communicate, but you will not be able to use all the protocols your modem supports.

- "Connection Rate" is the rate at which your modem and the remote modem connect (300, 1200, or 2400 bps). This rate is determined by the modems when they connect. *Synonyms:* Transmission Speed, Line Speed, Modem-to-Modem Speed.
- "Computer Rate" is the rate at which your modem and your computer communicate. You change this rate in your software. With the SupraModem 2400 MNP and the SupraModem 2400 Plus, this rate is usually higher than the connection rate. *Synonyms:* Serial Port Speed, Modem-to-Computer Speed, DCE-DTE Speed, Communications Rate.

How Error Correction & Data Compression Work

Error Correction

For error correction, the modem breaks your file down into blocks of data (frames) and calculates a checksum (the sum of all data bytes in the block). The block and the checksum are then transmitted. The receiving modem then calculates a checksum on the received data block and compares it with the checksum it received. If these numbers are different, the data block was not transmitted properly, and the modem resends the data.

Error correction is useful for communications that occasionally experiences a little telephone line noise or some other "glitch." However, error correction will not perform miracles on extremely noisy lines. If you have lots of errors, you may need to have your telephone circuits checked or change long distance carriers.

Data Compression

Data compression is accomplished by the sending modem analyzing the outgoing data for often repeated patterns of data (such as the letters "A" and "E" in English text). It then assigns a shorter data code that will transmit faster than the original data. The more often the same data codes occurs in the transmission, the better compression the modem can achieve.

Certain file types like text files and graphics screens are very good candidates for optimum compression. Files that have already been compressed with a program like Stuffit, ZIP, or ARC will probably not gain any additional compression and could even show a slight performance decrease with MNP 5. (V.42bis does not have this problem.) Additional information is provided later in this chapter.

Connection Rates

How the Modem Connects

When using a regular 2400 bps modem, your modem tries to connect to the remote modem at 2400 bps. If the remote modem can't connect at 2400 bps, your modem then tries to connect at 1200 bps. If that doesn't work, it then tries 300 bps. (This process is called "fall back.") Chapter 5 provides a table of actual connection rates.

After Connecting

Once connected, your modem sends your computer a result code that tells it the connection rate (for example, **CONNECT 1200**). Depending on how your software handles the result code, you either see the result code on your screen, or you see your software's interpretation of the result code. If nonsense characters appear on your screen at this point, the computer and connection rates are different.

With regular 2400 bps modems and "Direct" connections (explained in the next section), if the computer and connection rates are different you must use your software to change your computer rate to match the connection rate. (Otherwise, you'll see nothing but nonsense characters.) In this case, when your computer rate is the same as the connection rate, you can start communicating directly with the remote computer.

On the SupraModem 2400 MNP and SupraModem 2400 Plus, your computer rate and connection rate do not always have to match. The next section explains this in detail.

Note that some telecommunications software automatically changes your computer rate to match your connection rate.

Connection Types

You can use one of the following commands to tell your modem what type of connection you want it to try to make.

\N1 Direct Connection

If you use **\N1**, the modem will act just like a regular 2400 bps modem. Your computer rate and connection rate must match.

\N Normal Connection

If you use **\N**, the modem will still act just like a regular 2400 bps modem, except that you won't have to change your computer rate to match the connection rate, because you'll be using "flow control." (Flow control is explained later in this chapter.)

\N2 & \N4 Reliable Connection

If you use **\N2**, the modem will try to make an MNP connection. If it can't, the modem will hang up. On the SupraModem 2400 Plus, if you use **\N4** , the modem will try to make a V.42bis, V.42, or MNP connection, and if it can't, it will hang up. Reliable connections also feature flow control.

\N3 AutoReliable Mode

If you use **\N3**, the modem will try to make the best connection possible. If it can make an MNP 5 connection, it will (unless you've issued the **%CØ** command). If not, it will "fall back" through the other MNP options and 2400, 1200, and 300 bps, trying each one until it is able to connect. (On the SupraModem 2400 Plus, the modem will try to make a V.42bis or V.42 connection before trying MNP 5.) The connection the modem actually makes can be Reliable or Normal.

Which One Should You Use?

In most situations, you'll want to use **\N3**. If you only want to connect if an MNP connection can be made, use **\N2**; for V.42bis, V.42, or MNP only, use **\N4**.

Negotiation

When connecting, your modem will "negotiate" with the remote modem to determine what type of connection can be made (depending on the protocols each modem supports and the \N command used). The process of the modem determining the type of connection is called the "negotiation" or "detection" phase.

After Connecting

If "extended" result codes are enabled, your modem sends your computer a result code indicating what type of connection was made. Chapter 5 provides a table showing the possible connection types, and Appendix B lists the possible result codes.

At this point, you should not have to change your computer rate to the connection rate (because of flow control). Instead, you can immediately start communicating with the remote computer.

The exception to this is if you see nonsense characters on your screen. In this case, you have made a Direct connection (no flow control), and you DO have to change your computer rate to match your connection rate.

Automatic Rate Adjust (\J)

To take advantage of data compression (to achieve a throughput of greater than the connection rate), *rate adjust MUST be disabled* (\J). *Rate adjust IS disabled when the modem leaves the factory, or after you issue the &F2 command.* With rate adjust disabled, your modem does not change the computer rate to match the connection rate.

This command does not affect Direct connections. If you make a Direct connection, you must use your computer rate must match the connection rate as described earlier in this chapter.

Flow Control

(The Reason You Don't Have to Change the Computer Rate After Making a Normal or Reliable Connection)

Normal and Reliable connections use a technique called "flow control" (sometimes called hardware handshake) that lets your "computer rate" (computer-to-modem rate) be different than your connection rate.

Flow control is useful with data compression because your actual throughput is *higher* than the connection rate, and because the throughput *changes* depending on the compressibility of the data being sent.

Flow control lets your modem and computer tell each other when they can accept more data for transmission. This "handshaking" prevents data from being lost when the throughput rate is different than the computer rate. Both software and hardware flow controls are available, as the **\Q** command description in Appendix A explains in more detail.

For best performance, the computer rate should be set to 4800 bps for MNP 5 or to 9600 bps for V.42bis.

To use flow control, you must have the following:

- Hardware handshaking cable, described in Appendix E.
- Flow control enabled in your software.
- Flow control enabled by the **\Q3** command (bidirectional hardware flow control). This setting meets most people's needs, but you may need to use a different form of the **\Q** command. **\Q3** is the factory default with **&F2**.
- Automatic rate adjust disabled (**\JØ**). You can use this setting even if you are making a Direct connection. **\JØ** is the factory default with **&F2**.
- **DTR** disabled (**&D2**) if you are using a Macintosh.

The Configuration Most People Need

The following command line will set your modem to the data compression/error correction configuration most often needed:

AT &F2 &W [CR] or **AT &F2 &D2 &W [CR]** (for Macintosh)

The **&F2** command resets your modem to the factory configuration and then issues the following commands.

\N3	AutoReliable Connection. Make the fastest possible connection and use the best possible error correction and data compression.
\J	Don't change the computer's serial port speed to match the connection rate. (This keeps you from having to change the computer rate after you connect.)
\Q3	Use bidirectional hardware flow control.
\V1	Enable MNP extended result codes.

The **&D2** command required by Macintosh computers allows your cable to work properly for flow control.

SupraModem 2400 Plus owners should consider using the **\V2** command to select V.42bis extended result codes.

The **&W** saves the above settings in the "stored configuration" so that the modem is still set this way the next time it is turned on. (Chapter 6 explains this command in detail.)

Using ARC, ZIP, StuffIt, Xmodem, & Ymodem

MNP 5 Data Compression

We recommend disabling MNP 5 data compression (**%C**) when using an MNP Reliable connection and transferring files that are already compressed by compression software such as ARC, ZIP, or StuffIt. When files compressed by these programs are used with MNP 5, the files sometimes actually take longer to transfer than files transferred using a Reliable connection without data compression.

V.42bis Data Compression

V.42bis is sophisticated enough to recognize software-compressed data. When it recognizes that it cannot compress the data further, it disables data compression automatically. Then when it senses uncompressed data later, it re-enables data compression. To receive this and other benefits, use V.42bis rather than MNP 5 when possible.

Error Correction

Unlike data compression, it is usually advantageous to use MNP 2-4 or LAPM error correction for ANY file transfer, regardless of compression or software-based error correction protocols such as Xmodem, Ymodem, etc. The error correction protocol strips start and stop bits from each character (improving throughput up) and performs error correction on smaller chunks of data than do software-based error correction protocols (so if an error does occur, less data has to be retransmitted, taking less time).

5

DIALING, ANSWERING, & CONNECTING

Most of the time you'll use your telecommunications software to dial numbers and answer calls, and you'll be able to mostly ignore this chapter. But at some point you may need to tell your software something it does not inherently know, or you may need to set your modem to auto answer if your software can't do it for you. This chapter tells you what you need to know in situations like these.

Refer to your software manual for instructions on using your software to dial numbers and answer calls.

Using the Dial Command

The SupraModem dials telephone numbers when you give it the dial command (**D**) followed by a telephone number. It can be used alone or with modifiers.

The telephone number must be an ASCII string containing numbers Ø through 9 (for pulse dial lines) or those numbers and the characters A, B, C, D, #, and * (for touch-tone dial lines). Also, the number cannot exceed the size of the command buffer (40 characters excluding the **AT** prefix, spaces, the carriage return control character, and the line feed control character).

The modifiers are listed below and explained in detail in Appendix A. The modem uses the dial command modifiers in the order it encounters them on the command line, from left to right.

T	touch-tone dial
P	pulse dial
R	reverse mode from originate to answer mode (R must be last character in the command line)
W	wait for dial tone before processing the next character in the dial string (useful for PBX phone systems)
@	wait for quiet answer
,	pause before processing the next character in dial string
!	flash hook
;	return to command state after dialing (; must be last character in the command line)
S*x*	dial number stored in memory location *x*

To aid readability, spaces, hyphens, and parentheses can be added to the dial command line without affecting its function.

Example

AT DT 1 (405) 555-9624 [CR]

In this example, your SupraModem goes off-hook, waits for a dial tone, and then touch-tone dials the number 1 (405) 555-9624.

If your modem does not receive a valid carrier from the remote modem within 30 seconds (the default value of register **S7**), your modem hangs up and sends the **NO CARRIER** result code.

If the modem does receive a valid carrier within the time allowed, it will send a **CONNECT** message indicating the connection rate.

Pulse Dialing Example

AT DP 1 (405) 555-9624 [CR]

The **P** modifier tells the modem to pulse dial the numbers that follow it.

Example of Dialing Out from a PBX

Example 1: Using W

AT D 9W 5559624 [CR]

The modem dials one digit, 9, to access an outside line and then waits for a dial tone before it dials the rest of the dial string.

Example 2: Using a Comma

AT D 9, 5559624 [CR]

The modem dials the first digit (9) to access an outside line and then pauses before it dials the rest of the dial string.

Example of Combining Pulse & Touch-Tone Dialing

AT D P9 W T5559624 [CR]

This example combines several of the features described in previous examples. The **P** modifier tells the modem to pulse dial the number that follows it (9). The **W** modifier tells the modem to wait for a dial tone. The **T** modifier tells the modem to touch-tone dial the numbers that follow it.

Example of Issuing Commands Before the Dial Command

AT B1 SØ=1 DT 555-9624 [CR]

Note that only numbers or dial modifiers can follow the **D** on a command line.

Example of Punctuation & Spaces in the Dial Command

You can include punctuation and spaces in a dial command to improve readability because the command ignores these elements. This lets you avoid confusing commands such as **ATDT15025559624 [CR]**, which is equivalent to **AT DT 1 (502) 555-9624 [CR]**.

Example of Making a Call in Answer Mode

AT DT 5559624 R [CR]

The **R** modifier tells the modem to make the call in answer mode rather than originate mode.

Example of Returning to Command State After Dialing

AT DT 5559624; [CR]

The semicolon tells the modem to return to command state after dialing.

Example of Dialing a Number That is Longer than the Buffer

AT DT 9W (206)555-96248834998841!87504766543; [CR]

This string completely fills the command buffer, but the semicolon at the end of the line causes the modem to return to the command state so a second string can be processed. When it's ready for the second string, the modem returns the **OK** result code. At that time, a second string containing the rest of the number can be dialed, as follows:

AT DT 2196 #21135532 [CR]

Note that the first command line in this example contains the **!** dial command modifier, which causes the modem to go on-hook (hang up) for one half second. This operation (sometimes called a flash or hook-flash) is useful in some situations for transferring calls.

Dialing From a Telephone

You can also dial a number yourself on a telephone and give the modem a command that tells it you want to connect to another modem. The SupraModem offers two ways to do this.

The first method lets you call a remote modem that is set to auto answer. It is to be used in situations where you won't talk to a person before the modems connect. When you have a choice, we recommend simply using the modem to dial the number, instead of using this method. To use this method, follow these steps:

1. Type the following but DO NOT press the carriage return:

   AT X3 D

2. Dial the number yourself on the telephone.
3. When you hear a carrier from the remote modem, press the carriage return. Your modem will attempt to connect with the remote modem.

The second method lets you talk to someone at the other end of the line and then connect the modem without hanging up. To use the second method, follow these steps:

1. Talk to each other using telephones plugged into the **PHONE** jacks on the backs of your modems.
2. When you're done talking and you're ready to start using the modems, DO NOT hang up your telephone receivers.
3. *One of you:* Type **ATA [CR]**.

   The other one of you: Type **AT X3 D [CR]**. You'll both hear a high-pitched squeal from the phone and from your modem speakers (if they're turned on). Then you'll both see a **CONNECT** result code appear on your screens.
4. Hang up your phone receiver and use your computers however you wish. When you're done, simply hang up the modems by issuing the escape code (**+++**), followed by the **H** command. (You can do this from your keyboard or through your software). Momentarily, you should see the **OK** result code, indicating your modem has hung up.

Storing a Telephone Number

To store an often dialed telephone number in your modem's non-volatile memory, use the **&Z*x*=*n*** command, where ***x*** is the modem's memory location and ***n*** is the number you want to store.

The memory location in ***x*** can be Ø, 1, 2, or 3; you can store up to 4 different telephone numbers. The phone number in ***n*** must be a valid dial string as described earlier in this chapter. It can include any of the dial command modifiers except **S*x***.

If no value for ***x*** is supplied, Ø is assumed. Both the equal sign (=) and a value for ***n*** are required.

For example, the following command saves the tone-dialed telephone number T5559624 in location 1:

AT &Z1=T5559624 [CR]

Dialing a Stored Number

To dial a stored number, use **D** with the **S*x*** modifier. This command (shown below) dials the number stored in memory location ***x***.

AT DS*x* [CR]

For example, the following command dials the telephone number in memory location 1:

AT DS1 [CR]

Disabling Call Waiting

If you have "call waiting," we recommend that you disable it before using your modem. If you don't disable it and a call comes in while you are online, you will either lose data or be disconnected.

In many areas, you can disable call waiting by dialing ***71** or ***70**. Place this "code" either just before or just after the telephone number you are dialing, depending on your local phone system requirements. For example, you might use the following command:

AT DT *71 555-0000 [CR]

Call waiting will resume after you hang up. Consult your phone book or local telephone company to determine exactly how to disable call waiting in your area.

Answering Calls

The SupraModem provides three ways to answer calls:

- You issue the **A** command when you detect an incoming call. The **A** command causes the modem to answer the call immediately.
- You talk to another person on a telephone and then connect your modems without hanging up. This method is described earlier in this chapter, in the section called "Dialing From a Telephone."
- You set up your modem to "auto answer." In this case, your modem automatically answers any incoming calls. The rest of this section explains how to use auto answer.

The SupraModem answers incoming calls automatically (auto answer) if you set register **SØ** to a value from 1 to 255. The value you set it to determines the number of rings the modem will wait before it answers the call. The following example command sets the modem to answer incoming calls after the second ring:

AT SØ=2 [CR]

If you set the modem to auto answer and your modem shares a line with a telephone, the modem may answer calls before you can intercept it. For this reason, the modem defaults to not answering calls automatically. We recommend being very careful with auto answer unless you have a dedicated modem phone line.

If you set the modem to answer incoming calls, the **AA** indicator light on the front of the (external) modem remains lit unless the modem is detecting a ring. When the modem detects a ring, the light goes off briefly. (If the modem is not set to auto answer mode, the **AA** light works in the opposite manner; that is, it is off until it detects a ring and then flashes during the ring.)

Because it follows the industry standard, the modem must be set to 2400 bps or higher if it is to answer at 2400. If it is set to, say, 1200 bps and someone calls in at 2400, the modem will answer at 1200. The section in this chapter called "Connecting" further explains the rates at which two modems connect under different circumstances.

If you plan to connect your SupraModem directly to a mainframe or minicomputer where it will be dedicated to auto answer operation, you *might* need to change the modem's configuration from the default settings. Because every situation is different, it's hard to say what you'll need to change if you have problems. We suggest first trying the **Q1** command (which causes the modem to disable result codes). If **Q1** alone doesn't solve the problem, also try **&D** (which causes the modem to ignore **DTR**), and then if there's still a problem, also try **&C** (which causes **DCD** to always stay on). Please call Supra Technical Support if you need assistance.

If you plan to use your SupraModem to run a Bulletin Board System (BBS), you *might* need to change your modem's configuration from the factory settings. Please refer to your BBS software manual or contact the BBS software publisher for more information on how your modem should be set.

Connecting

Connection Rates

SupraModems can connect at 300, 1200, and 2400 bps, as follows:

		Originating Modem Calls At		
		300	**1200**	**2400**
Answering Modem Set To	**300**	300	1200*	1200*
	1200	300	1200	1200
	2400	300	1200	2400

* 300 bps modems can only connect at 300 bps.

Originating Example

If your modem (the originating modem) is set to 2400 bps and you call a modem that is set to 1200 bps (the answering modem), your modem will automatically "fall back" to connect at 1200 bps. At this point, if you see nonsense characters, use your software to change your computer rate to match your connection rate (1200 bps). Chapter 4 gives more information on what to do upon connecting.

Answering Example

If the answering modem is set to 2400 bps or higher and the originating modem calls at 1200 bps, the answering modem's rate will automatically fall back to 1200 bps. Whenever you answer with your modem set to 2400 bps or higher, your modem will adjust its connection rate automatically to the rate of the incoming call.

CCITT V.21 (300 bps) Connections

To make a 300 bps connection between modems using CCITT V.21, *both* modems must be set to 300 bps.

Connection Types

This table shows the type of connection your modem negotiates when it connects to a error correction/data compression modem.

Answering Modem Set To	Originating Modem Calls At: Normal \N	Direct \N1	Reliable \N2	Auto-Reliable \N3	Reliable \N4 (Plus Only)
Normal \N	Normal	Direct or Normal	hangs up	Normal	hangs up
Direct \N1	Normal or Direct	Direct	hangs up	Normal	hangs up
Reliable \N2	hangs up	hangs up	MNP	MNP	MNP
Auto-Reliable \N3	Normal	Direct	MNP	MNP or LAPM	LAPM or MNP
Reliable \N4 (Plus Only)	hangs up	hangs up	MNP	LAPM or MNP	LAPM

All Normal and Reliable connections also take advantage of flow control, which allows your computer and modem rates to be different. With Direct connections, these rates must be the same.

You can only use data compression if you have made an error correcting (MNP or LAPM) connection with another modem that supports data compression. If your modem is set to the default **%C1**, an MNP 5 (or BTLZ) data compression connection will be attempted. MNP 5 is only used with MNP error correction. BTLZ is only used with LAPM error correction, and only available on the SupraModem 2400 Plus. If a data compression connection cannot be made, or if **%C0** has been used to disable MNP 5 data compression, only error correction will be used.

6

CREATING CUSTOM MODEM CONFIGURATIONS

Should You Configure Your Modem?

Before your SupraModem left the factory, it was set up to act a certain way; for example, it returns full-word result codes and waits for a dial tone before dialing. These settings will work for most situations. In some circumstances, however, you may need to change your modem's configuration — like if you want to use your modem to auto answer, or if you want to store the data compression/error correction settings you use most often. This chapter tells how to do that.

How Modem Configuration Works

There are three types of modem configurations: factory, active, and stored. The following sections explain what each is and how you can use them.

Factory Configuration

The factory configuration is stored in the modem's permanent memory (called firmware ROM). In **AT** command and S register descriptions, the word "default" indicates which settings are factory configuration settings.

Active Configuration

The active configuration is the configuration you're using when you have your modem turned on. It is stored in the modem's temporary memory (called temporary RAM).

If you issue the **\S** command, most of your active configuration will be listed on your screen.

Changing the Active Configuration

You can create a custom configuration by changing the settings in the S registers that comprise the active configuration. The SupraModem **AT** commands let you change most of these registers indirectly, by issuing single commands. As an alternative to using the **AT** commands, you can directly change the register settings by issuing the **S***r*=*n* command described in Chapter 7.

We recommend using the ***AT*** *commands (instead of changing the settings directly) whenever possible.*

Other useful commands you may want to use when creating a custom configuration include the following:

- **&FØ**, **&F1**, and **&F2**, which reset the active configuration to preset factory configurations
- **Z***n*, which resets the modem and loads a stored configuration, which is described in following sections

Saving the Active Configuration

You can save most of your active configuration in the modem's nonvolatile RAM by issuing the **&W***n* command. The settings that are saved when **&W***n* is issued are listed later in this chapter in the section called "Modem Settings That Can Be Saved in Stored Configurations." If you don't save your active configuration, it will be lost when you turn the modem off.

The **&W***n* saves the active configuration in memory location *n* (*n* = 1 or Ø). If a value for *n* is omitted, Ø is assumed.

Stored Configuration

If you save the active configuration using the **&W***n* command, it becomes a stored configuration that resides in the modem's non-volatile RAM.

Whenever you turn on your modem, it loads the stored configuration from memory location Ø into the active configuration area. (You can use **&Y** to cause the configuration from location 1 to be loaded instead.) You can also load a stored configuration yourself by issuing the **Z***n* command (*n* = 1 or Ø).

Changing the Stored Configuration

You can change the stored configuration by changing the active configuration and then saving it using the **&W***n* command.

Configuration Summary

The following table summarizes the three configurations.

Configuration	Stored in Memory	User-Changeable	Saved at Power Loss
Factory	permanent (firmware ROM)	no	yes
Active	temporary RAM	yes	no, unless saved as stored configuration by issuing &W command
Stored	nonvolatile RAM	yes, indirectly, by changing the active configuration and then saving it using &W command	yes

Modem Settings That Can Be Saved in Stored Configurations, and Their Factory Defaults

The following tables list the modem characteristics that are saved in stored configurations when the **&W*n*** command is issued. Also listed are the characteristics' possible settings and their settings after the **&F** command is issued (the factory settings).

To change a characteristic, use the appropriate **AT** command or S register, as listed. Chapter 3 and Appendix A explain the **AT** commands, and Chapter 7 and Appendix C explain the S registers.

The settings in S registers 1–10, 12, 13, 15–17, 19, 20, 24, 37, and 100 are not saved when the **&W*n*** command is issued.

Characteristic	Possible Settings	Factory Setting	Cmd.	S Reg.
computer rate	9600, 4800, 2400, 1200, 300	2400	*	23
asynchronous parity	even, odd, mark, space, none	even	*	23
originate/answer	originate, answer	originate	A, D	14
max. block size	64, 128, 192, 256	256	\A	none
AutoReliable fallback char.	ASCII Ø-127	Ø	%A	none
300 and 1200 bps protocols	Bell 103/212A, CCITT V.21/V.22	Bell	B	27
DCD	on, on only with carrier present	on with carrier	&C	21
AutoReliable buffer	disabled, 200 char. buffer, wait for %A character	disabled	\C	none
data compression	disabled, enabled	enabled	%C	none
dial type if not specified in dial command	tone, pulse	pulse	DTn, DPn	14

* Must be changed using telecommunications software.

continued on next page...

Characteristic	Possible Settings	Factory Setting	Cmd.	S Reg.
command echo	no echo, echo	echo	E	14
factory configuration	*see &F description*	&F	&F	none
guard tones	disabled, 550 Hz, 1800Hz	disabled	&G	23
modem-modem flow control	off, XON/XOFF	off	\G	none
auto rate adjust	disabled, enabled	enabled	\J	none
detection phase (Plus Only)	disabled, enabled, MNP preferred	enabled	-J	none
break control	*see \K description*	\K5	\K	none
speaker volume	low, medium, high	medium	L	22
stream link	stream, stream with 260 block	stream	\L	none
speaker control	*see M description*	M1	M	22
asynchronous/ synchronous	async, sync1, sync2, sync3	async	&M	27
connection type	Normal, Direct, Reliable, AutoReliable	Direct	\N	none
pulse dialing	US/CANADA, UK Hong/Kong, 10 pps, 20 pps	US/Can. 10 pps	&P	22, 31
result codes	disabled, enabled	enabled	Q	14
serial port flow control	disabled, XON/XOFF, bidir. H/W, unidir. H/W	disabled	\Q	none
synchronous CTS follows...	RTS, carrier	RTS	&R	21
DTR	*see &D description*	&D2	&D	21, 31

Characteristic	Possible Settings	Factory Setting	Cmd.	S Reg.
auto answer	Ø=disabled, 1-255=ring to answer on	disabled	SØ=n	Ø
tone duration/ time between tones	50-100 ms.	100	S11=n	11
test timer length	1-255 seconds, Ø=disabled	disabled	S18=n	18
delay to DTR change	Ø-255 1/100 sec.	5	S25=n	25
RTS-to-CTS delay	Ø-255 ms.	5	S25=n	26
DSR	on, on only with carrier present	on	&S	21
test request	ignore, accept	ignore	&T	23
inactivity timer	1-90 minutes, Ø=disabled	disabled	\T	none
result code type	words, numbers	words	V	14
result code set	standard, MNP, V.42bis (Plus Only)	standard	\V	none
dialing	*see X description*	X4	X	22
configurations	Ø, 1	Ø	&Wn, &Y	31
transmit timing	*see &X description*	pin 15 clock	&X	27
XON/XOFF pass-through	do, don't pass XON/XOFF chars.	do	\X	none
long space disconnect	disabled, enabled	disabled	Y	21
telephone numbers	*see &Zx=n description*	*none*	&Zx=n	none

Common Modem Configurations

Some common configurations are listed below. After you issue any of these command lines, the saved configuration will be loaded each time you turn on your modem, until you change the configuration.

Standard Modem Configuration

The following command line loads the factory configuration that makes your modem act like a standard 2400 bps modem.

AT &F [CR]

Data Compression/Error Correction Configuration (As Shipped from Supra Corporation)

To set the modem to the most common data compression/error correction configuration, issue the following command line. The **&F2** command loads the factory configuration and configures the modem for data compression/error correction operation, and the **&W** command stores this configuration in memory location Ø. Chapter 4 explains this command line in detail.

AT &F2 &W [CR]

Macintosh

If you are using a Macintosh, also include the **&D2** command (followed by the **&W** command) in one of the command lines given above. On Macintosh computers, the **&D2** command allows your modem to work properly with hardware handshaking. The following command line configures your modem for Macintosh data compression/error correction operation.

AT &F2 &D2 &W [CR]

CCITT V.21/V.22

If you are using a SupraModem outside the United States and Canada (as explained in Chapter 8), also include the **B** command (followed by the **&W** command) in one of the command lines given above. The **B** command sets the 300 and 1200 bps protocols to CCITT V.21 and V.22. The following command line will configure your modem for data compression/error correction operation outside the United States and Canada.

AT &F2 B &W [CR]

7

CHANGING S REGISTER SETTINGS

As explained in Chapter 6, you can customize your modem's configuration by changing the settings of some of the modem's S registers. This is useful in special circumstances, like when you want to use your modem to auto answer.

Note: If you have a choice, use **AT** commands instead of changing the S registers directly. **AT** commands let you change many S register settings without having to worry about the modem's lower-level structure.

The S registers changed most often are **SØ** Auto Answer, **S7** Time to Wait for Carrier Before Hanging Up, **S8** Comma Pause Time, **S9** Time to Wait Before Recognizing Carrier, and **S11** Spacing Between and Duration of Tone Dialing Tones.

This chapter explains how to read and modify the S registers. Appendix C describes the S registers in detail.

Reading the Contents of an S Register

The **S*r*?** command displays the value in register *r*. The *r* must be a register number (Ø–27, 31, 37, or 100). The modem always returns three decimal digits for each register that is read and follows this number with a carriage return and a line feed character.

Example 1

ATSØ? [CR]

ØØ5 (from modem)

OK (from modem)

This command reads a single register, Ø, and displays its three-digit value at your computer. For example, if the value in the register is 3, the modem will display ØØ5.

Example 2

ATSØ?S7? [CR]

ØØØ (from modem)

Ø3Ø (from modem)

OK (from modem)

This command line reads two registers, Ø and 7, and displays their three-digit values, Ø and 30 respectively, at your computer.

Modifying the Contents of an S Register

The **S*r*=*n*** command sets the value in S register *r* to *n*. The *n* must be a decimal integer from Ø to 255.

Example

ATSØ=4 [CR]

This command sets register **SØ** to 4, which causes the modem to automatically answer all incoming calls after the fourth ring. The modem replies with **OK** to acknowledge that the command has been executed and that the modem is ready to process a new command.

Modifying or Reading a Register Without Naming It

The **S*r*=*n*** and **S*r*?** commands can also be used without directly naming the register. The modem remembers the last register accessed and allows you to set or read it by typing **AT=*n*** or **AT?**.

Example 1

ATSØ [CR]

OK (from modem)

AT=3 [CR]

OK (from modem)

This example shows how a value of 3 is given to **SØ** when **SØ** was the last register accessed.

Example 2

ATSØ=7 [CR]

OK (from modem)

AT? [CR]

ØØ7 (from modem)

OK (from modem)

This example uses the **S*r*=*n*** command to modify register **SØ** and then uses **AT?** to read the register. **AT?** responds by displaying the value in register **SØ**.

8

BELL/CCITT INTERNATIONAL COMPATIBILITY

You might need to change your Bell/CCITT protocols if:

- You plan to make calls to or receive calls from modems outside your country.
- Your modem is set to use the CCITT protocols and you issue the **&F** command to restore the modem's factory configuration. (**&F** sets the modem to Bell protocols.)

The Protocols You Should Use

The SupraModem lets you use five different communication protocols: Bell 103, Bell 212A, CCITT V.21, CCITT V.22, and CCITT V.22bis. You will probably only use three of these protocols — one for 300 bps connections, one for 1200 bps, and one for 2400 bps. The three you need to use depend on the protocols of the modem to which you want to connect.

For calls within the United States and Canada, use the "Bell" protocols: Bell 103 at 300 bps and Bell 212A at 1200 bps. This is the factory default setting on SupraModems.

For calls within most other countries, use the "CCITT" protocols: V.21 at 300 bps and V.22 at 1200 bps. SupraModems made for use in places other than the U.S. and Canada are set to use these protocols when shipped from Supra Corporation, but the **&F** command resets the modem to the "Bell" protocols.

The 2400 bps protocol (CCITT V.22bis) is the same everywhere.

For international calls, both modems *must* use the same protocols. If your modem and the modem to which you want to connect use different protocols, one of the modems must be changed so the protocols are the same.

Changing Protocols

If you need to change your modem's communication protocols between Bell and CCITT, use the **B** command. **B** sets the 300 and 1200 bps protocol to CCITT V.21 and V.22, respectively, and **B1** sets them to Bell 103 and 212A.

When your modem connects, it *automatically* switches to the communication protocol that's appropriate for that rate. For example, if you connect at 1200 bps, the modem automatically uses the Bell 212A protocol (if your modem is set to use the Bell protocols) or the CCITT V.22 protocol (if your modem is set to use the CCITT protocols). When you make a 1200 bps MNP 5 connection, your modem will use both CCITT V.22 *and* MNP 5.

9

SOLVING PROBLEMS

Solving Problems Yourself

If you encounter problems with your SupraModem, first try completely disconnecting and then reconnecting the modem as explained in Chapter 2. (For your modem and many other electronic products, this solves common problems that are caused by incomplete connections.)

If you continue to have problems, try using the potential solutions given in the rest of this section.

Problems Before Trying to Connect to Remote Modem

- If you have an external modem and the modem appears to have no power, make sure you are using the power adapter that came with your modem (9 VAC) and that the modem is plugged into a working power outlet. If you are, press the **ON/OFF** button once or twice. If the modem still does not have power, disconnect it from your computer and press the **ON/OFF** button once or twice again. If the modem turns on, the problem is with your computer's serial port or your RS-232C cable; contact your computer dealer for assistance. If the modem does not turn on, the problem is with the modem or power supply; call Supra Technical Support for assistance.

- If your computer is not sending data to your modem, one of the following is probably the reason. (On external modems, in this situation the **SD** indicator light will not flash on and off when you press your computer keys.)
  - The modem and computer are not connected properly. Check the connections, and make sure the RS-232C cable is plugged into the correct port on the computer. Also make sure that the

data is going to the correct serial port. Your computer may have other serial ports for your printer, mouse, etc.; some software requires that you tell it which serial port you're using.
  - The RS-232C cable is damaged or the wrong type for your computer. Get a working cable from your dealer.
  - Your computer's serial port is not working properly. Contact your local computer dealer for assistance.
  - Your modem is not working properly. Contact Supra Technical Support for assistance.

- If you have an IBM PC or compatible and your software does not recognize the modem, one of the following is probably the problem:
  - You have more than one piece of hardware assigned to the same COM port. Make sure only one device is assigned to each COM port.
  - The COM port selected in your software is different than the COM port selected on the modem board (internal modems only). Make sure the COM port selected in your software is the same as the COM port selected on the modem board. When shipped, the modem board is set to COM3. Chapter 2 provides more information.

- If what you type does not appear on the screen, enable command echo by issuing the **E1** command; then issue the **&W** command.

- If two letters appear on the screen for every one you type while in the command state, disable command echo by issuing the **E** command. You can also solve this problem by using your telecommunications software to change your computer setting to full duplex operation.

- If you type **AT** followed by a carriage return and the modem does not acknowledge it with the **OK** result code, one of the following may be the problem.
  - You are not in the command state. Enter the escape code (+++) to switch from online state to command state.
  - Your computer is set to a rate other than 300, 1200, 2400, 4800, or 9600. Use your software to change your computer rate to one of these rates.
  - Result codes may be disabled. Issue the **Q** or **&F** command, and then issue the **&W** command.
  - Your computer's serial port is not working properly. Contact your local computer dealer for assistance.

- If you type **AT** followed by a carriage return and the modem returns a Ø, your modem is set to use number result codes instead of word result codes. Issue the **V1** command, and then issue the **&W** command.

Problems When Trying to Connect to Remote Modem

- If you are using a Macintosh and flow control, and your modem responds but you can't connect, you may have the wrong cable. Chapter 1 and Appendix E explain what type of cable you need.

- If you cannot connect with another modem, your modem may be using different communication protocols (Bell/CCITT) than the modem with which you are trying to connect. Both modems must use the same communication protocols. Chapter 8 explains how to determine the type of protocols your modem uses and how to change them if you need to.

- If you are having trouble making a Reliable connection, one of the following may be the problem:
  - Your modem is not set to make a Reliable connection. Issue the **&F2** command, or issue the **\N2** or **\N3** command (or **\N4** if your modem is a Plus). Chapter 4 provides more information on these commands.
  - The remote modem does not support MNP (or V.42). A Reliable connection is not possible in this case.
  - The remote modem supports MNP (or V.42), but it is not in Reliable mode. Have the remote modem operator set the remote modem to **\N2** or **\N3** (or **\N4** if it supports V.42).
  - The remote modem supports MNP (or V.42) AND either gets confused by the length of time your modem takes to "negotiate" the connection or confuses negotiation characters with the remote computer's log-in sequence. In this case, try using **\N** (Normal) instead.
  - The connection is so poor and noisy that even a Reliable connection would be unable to assure dependable communication. Try making a Normal connection instead, or try connecting over a different line or at a different time. A variety of factors can cause line noise.

- If you recently issued the **&F** command and you are having problems trying to use the CCITT protocols to connect, you may need to change your 300 and 1200 bps protocols to CCITT, as explained in Chapter 8.

Problems While Connected

- If you have connected to a remote modem but your computer has frozen up or all you see on your screen are garbage characters, one of the following may be the problem:
  - YOUR MODEM CABLE DOES NOT SUPPORT HARDWARE HANDSHAKING or is not working properly. Appendix E explains the type of cable you need.
  - You have made a Direct connection, and your computer and modem are communicating at different rates because the modem connected at a different rate than it was originally set to. Use your software to change the computer rate so it matches the connection rate given in the **CONNECT** result code.
  - Your computer and the remote modem are set to different data bits (word length), parity, and number of stop bits. The most common are 8 data bits (8-bit word length), no parity, and 1 stop bit (8, none, 1). Use your software to change these settings.
  - You have selected hardware or software flow control on the modem (using **\Q1**, **\Q2**, **\Q3**, **&F1**, or **&F2**), but not in your software. Both your hardware and software must be set to use the same type of flow control. If your software does not let you turn flow control on and off, it either handles flow control automatically, or it does not support flow control. If your software does not support flow control, you cannot use Reliable or Normal connections. In this case, either obtain software that supports flow control, or disable flow control by issuing the **\QØ** command.
  - Your computer's serial port is not working properly. Contact your local computer dealer for assistance.
  - Your modem is not working properly. Contact Supra Technical Support for assistance.
  - You are using CCITT protocols and trying to make a 300 bps connection with one or both of the modems set to 1200 or 2400 bps. SupraModems using CCITT protocols must both be set to 300 bps to make a connection at 300 bps. Chapter 5 provides more information.

- If your online communication is very slow and you are using error correction (and if you have an external modem the **TE** light is flashing a lot), it may be that you are connected to the remote modem on a very noisy phone line (with lots of static, like you can hear on a voice phone sometimes). In this case, the modem

has to continually resend data, slowing your actual throughput. To solve this problem, try hanging up and reconnecting.

- If the modem suddenly disconnects from the remote computer and displays the **OK** result code when you are transferring data, issue the following command line and then get back online and try your transfer again: **AT &D &W [CR]**.

- If you are using a Macintosh and flow control, and you can connect but you have problems communicating on line, you may have the wrong cable. Chapter 1 and Appendix E explain what type of cable you need.

- If you are losing data when using hardware serial port flow control (**\Q3**), one of the following may be the problem:
  - Flow control is turned off in your software. Use your software to turn flow control (or hardware handshake) on.
  - Your external modem cable does not support flow control. Chapter 1 and Appendix E provide more information.

- If you are losing data when using XON/XOFF serial port flow control (**\Q1**), one of the following may be the problem:
  - You are trying to transfer binary data. Disable XON/XOFF flow control. The description of the **\Q** command in Appendix A provides information on your options.
  - You are using **\X1** (recognize XON/XOFF characters and pass them through). Using **\X1** with **\Q1** causes the remote modem to receive XON/XOFF characters intended for your modem. Instead, use **\X1** with **\Q3** (for any type of communication) or use **\X** with **\Q1** (for ASCII communication only).

- If you enter the escape code (**+++**) but the modem does not acknowledge it by sending the **OK** result code, one of the following may be the problem.
  - You issued the plus signs (+) too quickly. Wait two seconds after sending any characters before sending the escape code, then send the escape code, and then wait two more seconds. You should see the **OK** result code.
  - Your computer rate is different than the connection rate. Use your software to change your computer rate.
  - The escape code character has been changed in register **S2** from a plus sign (+) to something else. Change the escape code character back to a + or use the character in **S2**.

- If you cannot get your software to hang up, issue the escape code (+++) followed by the **H** command. After your software hangs up, try to solve the problem so that it won't happen in the future by issuing the **&D2** command followed by the **&W** command and then trying your software again. If this does not solve the problem, read your software manual to determine what your software needs to hang up properly.

- If you have changed your modem configuration and can't get your modem to work properly, read the section in Chapter 6 called "Common Modem Configurations."

If You Need Help

If you need further assistance, please contact your dealer or call Supra Technical Support, (503) 967-9081, between 9 a.m. and 4 p.m. PST, Monday through Friday.

Before calling: Please type the following command (if possible). When calling, have the modem's response to this command handy.

AT \S [CR]

Note: Do not return any equipment to Supra Corporation for service without first contacting us and obtaining a Return Materials Authorization (RMA) number.

Five Year Limited Warranty

Our Warranty to you:
Supra Corporation (Supra) warrants that for a period of five years from the date of **original** retail purchase, our products will be free from defects in material and workmanship. If you discover a defect covered by this warranty, we will repair, replace, or refund the purchase price of the product at our option using new or remanufactured components. **Supra's liability is limited solely to the repair, replacement, or refund of the defective product.** This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

How to obtain service under this warranty:
To obtain free service under this warranty you must deliver the product and the original sales receipt to the dealer you purchased this product from or to Supra Corporation. If you decide to return the product to Supra, you must first call Supra Technical Support

and obtain an RMA as explained in the previous section. You are responsible for paying shipping costs to and from Supra.

Product failures not covered by this warranty:
This warranty covers defects in manufacture that arise from correct use in a home or office environment. It does not cover damage caused by abuse, misuse, improper modification or repair, moisture, corrosive environments, shipping, or high voltage surges from external sources such as power line, telephone line, or connected equipment. This warranty also does not apply to any product with an altered or defaced serial number.

Limits of Supra's liability:
We are only responsible for the repair of this product. We will not be liable to you or anyone else for any damages that result from the failure of this product or from the breach of any express or implied warranties. These include damage to other equipment, lost data, lost profits, or any consequential, incidental, or punitive damages. **IN NO EVENT WILL SUPRA BE LIABLE FOR ANY AMOUNT GREATER THAN THE CURRENTLY SUGGESTED RETAIL PRICE OF THIS PRODUCT.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Our legal disclaimer:
THIS WRITTEN WARRANTY REPRESENTS THE ENTIRE WARRANTY AGREEMENT BETWEEN SUPRA AND YOU. THIS WARRANTY MAY NOT BE ALTERED IN ANY WAY OTHER THAN IN WRITING BY AN OFFICER OF SUPRA CORPORATION. ANY IMPLIED WARRANTIES THAT MAY EXIST INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED IN DURATION TO A PERIOD OF FIVE YEARS FROM ORIGINAL RETAIL PURCHASE. NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

A

AT COMMAND DESCRIPTIONS

This appendix provides an overview of how the **AT** commands are used and describes each command in detail. Be sure to read Chapter 3 before using these commands.

Command Overview

General Commands

+++	Escape Code
A/	Re-execute Last Command
AT	"Attention" Command Line Prefix
E	Enable/Disable Command Echo
L	Speaker Volume
M	Speaker Control
Q	Enable/Disable Result Codes
S*r*=*n*	Write to S Registers
S*r*?	Read S Registers
\S	Show Active Configuration Profile
V	Verbose/Numeric Result Codes

Phone Line Commands

A	Answer Phone Line
D	Dial Telephone Number
H	Off Hook/Hang Up
O	Go Online
X	Dialing and CONNECT Result Codes
&Z*x*=*n*	Store Telephone Number

Test and Diagnostic Commands

I	Request Product Code I.D. or ROM Checksum
&T	Test Modem

Configuration & Compatibility Commands

B	BELL/CCITT Protocol Compatibility
Y	Enable/Disable Long Space Disconnect
Z	Reset Modem and Load Stored Configuration
&C	Data-Carrier-Detect (DCD) Behavior
&D	Modem Reaction to DTR
&F	Load Factory Configuration Profile from ROM
&G	Guard Tone Selection
&J	Telephone Jack Selection
&L	Dial-up Line/Leased Line
&M	Asynchronous/Synchronous Mode
&P	Select Make/Break Ratio for Pulse Dial
&R	Request-to-Send (RTS)/Clear-to-Send (CTS)
&S	Data-Set-Ready (DSR) Action
\V	Standard/Extended Result Codes
&W	Write Active Configuration to Nonvolatile Memory
&X	Synchronous Transmit Clock Source
&Y	Load Configuration Profile at Power-Up

MNP and V.42bis Commands

\A	Maximum Block Size *(MNP Only)*
%A	Set AutoReliable Fall Back Character
\B	Transmit Break
\C	Set AutoReliable Buffer
%C	Enable/Disable Data Compression *(MNP Only)*
\G	Modem-to-Modem Flow Control
"H	V.42bis Compression *(Plus Only)*
\J	Automatic Rate Adjust
-J	Detection Phase Control *(Plus Only)*
\K	Break Processing Control
\L	MNP Stream/Block Link *(MNP Only)*
\N	Operating Mode
%N	Maximum Connection Rate *(Plus Only)*
"N	V.42bis Dictionary Size *(Plus Only)*
\O	Originate Reliable Link *(MNP Only)*
"O	V.42bis String Length *(Plus Only)*
\Q	Serial Port Flow Control
\T	Set Inactivity Timer
\U	Accept Reliable Link *(MNP Only)*
\X	Set XON/XOFF Pass-Through
\Y	Establish a Reliable Link *(MNP Only)*
\Z	Switch to Normal Mode *(MNP Only)*

Command Descriptions

+++ Escape Code

Returns the modem to command state. The section called "Escape Code (+++)" in Chapter 3 explains the escape code in detail.

A Answer Phone Line

Causes your modem to immediately attempt to answer a call (go off hook and enter answer mode). The modem will go online when it detects a carrier.

A/ Re-execute Last Command

Re-executes the last command line entered. *This command is NOT preceded by* **AT** *or followed by a carriage return.* The section called "Command Line Buffer" in Chapter 3 explains how the **A/** command works.

\A Maximum Block Size *MNP Only*

Sets the maximum block size that can be transmitted.

\A	Sets maximum block size to 64 characters.
\A1	Sets maximum block size to 128 characters.
\A2	Sets maximum block size to 192 characters.
\A3	Sets maximum block size to 256 characters (default).

A larger block size increases throughput over a good line. A smaller block size may improve data transfer speeds over poor lines. MNP 4 and 5 dynamically adjust the size of the blocks based on the number of retransmissions. This command does not affect MNP 2 and 3.

%A*n* Set AutoReliable Fall Back Character

When **\C2** is in effect, if the ASCII code *n* is received before a Reliable connection is negotiated, the modem will make a Normal connection. This command can be used to speed up the detection of a call from a user who sends a known character to indicate a modem without data compression/error correction is being used. The value of *n* can be any ASCII character from Ø to 127 (default = Ø).

AT "Attention" Command Line Prefix

Signals the beginning of a command line. The "Command Line" section and other sections in Chapter 3 explain the function of the **AT** command line prefix.

B BELL/CCITT Protocol Compatibility

Sets the protocol for 300 and 1200 bps operation to CCITT or Bell.

- **B** Sets the protocols to CCITT V.21 (300 bps) and V.22 (1200 bps).
- **B1** Sets the protocols to Bell 103 (300 bps) and 212A (1200 bps).

The factory default is **B1** for modems intended to be used in the United States & Canada. Other modems are set to **B** before being shipped from Supra Corporation. Chapter 8 provides more information.

\B Transmit Break

Sends a 300-millisecond break to the remote modem. You must issue the escape code (+++) from the online state before issuing this command. The way the break is processed depends on the **\K** command used.

&C Select Behavior of Data-Carrier-Detect (DCD)

Determines the way Data-Carrier-Detect (**DCD**) — RS-232C pin 8 — behaves when it receives a data carrier from the remote modem.

- **&C** Causes the modem's **DCD** circuit to remain on regardless of the state of the data carrier from the remote modem.
- **&C1** Causes the modem's **DCD** circuit to track the data carrier from the remote modem and switch to on when a data carrier suitable for the SupraModem is present (default).

\C Set AutoReliable Buffer

Controls buffering used during MNP or V.42bis negotiations.

- **\C** Disables AutoReliable fallback character and buffer (default).
- **\C1** Buffers 200 characters. If the buffer fills before a Reliable link has been negotiated, the modem makes a Normal connection.
- **\C2** If the ASCII code set by the **%A** command is received before a Reliable link is negotiated, the modem makes a Normal connection.

The AutoReliable buffer allows for the storage of characters that aren't part of the negotiation process while the negotiation is in progress. When connecting to a modem without data compression/error correction that immediately sends data (such as a bulletin board log-on sequence) the modem can buffer this data until a Normal modem fallback decision is made.

%C Enable/Disable MNP 5 Data Compression *MNP Only*

Controls whether your modem will attempt to use MNP 5 data compression.

- **%C** Disables MNP 5 data compression.
- **%C1** Enables MNP 5 data compression (default). Data compression will only be used if an MNP error correcting connection has been established and the remote modem also supports MNP 5.

D*n* Dial Telephone Number

Causes the modem to dial the telephone number in *n*, which must be an ASCII string containing numbers Ø through 9 (for pulse phone lines) or those numbers and the characters A, B, C, D, #, and * (for touch-tone phone lines). The length of *n* cannot exceed the size of the command buffer.

The **D***n* command can be used alone or with the following modifiers. For a thorough discussion of dialing, refer to Chapter 5.

T Causes the modem to touch-tone dial the numbers that follow it in the dial string.

P Causes the modem to pulse dial the numbers that follow it in the dial string.

R Causes the modem to originate the call in answer mode. **R** is used to connect to an originate-only modem, and it must be the last character in the dial string. This is useful for calling a modem that is in originate mode.

W Causes the modem to wait for a dial tone before dialing the numbers that follow it in the dial string. The modem waits for the amount of time in register **S7** (default = 30 seconds); presumably by that time a dial tone will be present.

@ Causes the modem to wait for the time in register **S7** (default = 30 seconds) for one or more rings followed by five seconds of silence (a quiet answer) before processing the next characters in the dial string. If it does not find a quiet answer, the modem hangs up and returns the **NO ANSWER** result code to the computer. If it detects a busy signal, the modem hangs up and returns the **BUSY** result code to the computer.

, (Comma) Causes the modem to wait for the time in register **S8** (default = 2 seconds) before processing the next character in the dial string. Multiple commas can be used consecutively to generate longer pauses.

To dial out from a PBX system, insert the comma in the dial string after the "9" used to access an outline. The comma should allow enough time for a dial tone to be established before the modem dials the phone number.

! Causes the modem to go on-hook for one-half second. This operation, sometimes called a hook-flash, is like briefly pressing down the button on your telephone. This can be used for transferrng calls on some phone systems.

; Causes the modem to return to command state after dialing. This allows you to dial long telephone numbers by issuing a dial command (**D**) and ending the line with a semicolon, then repeating that action as many times as necessary. Chapter 5 provides an example of how this is done.

S*x* Dials a telephone number stored (using **&Z***x*=*n*) in the modem's nonvolatile memory location *x*. The memory location in *x* can be Ø, 1, 2, or 3. If no value for *x* is supplied, Ø is assumed.

&D Select Modem Reaction to DTR

Determines how the SupraModem reacts to the behavior of the Data-Terminal-Ready interchange circuit (**DTR**) — RS-232C pin 2:

&D Causes the modem to ignore **DTR**. This setting is usually required for flow control on Macintosh computers.

&D1 Causes the modem to assume the asynchronous command state if it detects an on-to-off transition on **DTR**.

&D2 Causes the modem to disconnect, assume the asynchronous command state, and disable auto answer mode if it detects an on-to-off transition on **DTR** (default).

&D3 Causes the modem to re-initialize and load stored settings from nonvolatile RAM if it detects an on-to-off transition on **DTR**.

&D4 Allows your computer to **DTR** dial your modem. Allow a 1 second delay after power up before **DTR** dialing.

Note: When the modem is online, it ignores a change of **DTR** (on or off) that persists for less time than the value in register **S25** (default = 5/100 seconds). The **TR** light follows the status of the **DTR** line and is not affected by the **&D** command.

E Command Echo

Controls the echo of characters sent to your modem from your computer when the modem is in the command state.

- **E** Inhibits command echo.
- **E1** Enables command echo (default).

If your computer expects characters to be echoed, use **E1**. If you don't, your computer will not display the characters you type.

If your computer does not expect characters to be echoed, use **E**. Otherwise, each character you send will be duplicated on your screen; for example, **ATDT** will look like this: **AATTDDTT**.

&F Load Factory Configuration Profile from ROM

Loads the modem's active configuration area with the factory configuration profile from ROM. Chapter 6 describes the factory configuration profile.

- **&F** Load factory configuration.
- **&F1** Load factory configuration and also these settings: **\N3**, **\V**, **\J1**, **\Q3**.
- **&F2** Load factory configuration and also these settings: **\N3**, **\V1**, **\J**, **\Q3**. This configuration is preferable for most connections.

&G Guard Tone Selection

Controls guard tone generation (not used with Bell 103 or 212A).

- **&G** Do not generate guard tones (default).
- **&G1** Generate 550 Hz guard tone.
- **&G2** Generate 1800 Hz guard tone.

\G Modem-to-Modem Flow Control

Sets the flow control method during a Normal connection. This command has no affect on Direct or Reliable connections, since Direct has no flow control and Reliable has its own method of modem-to-modem flow control.

- **\G** Disables modem-to-modem flow control (default).
- **\G1** Enables modem-to-modem XON/XOFF flow control.

H Hook Control

Operates the telephone line relay.

- **H** Causes the modem to go on-hook (hang up).
- **H1** Causes the modem to go off-hook (answer phone).

"H V.42bis Compression Control *Plus Only*

Controls V.42bis compression.

- **"H** Disables V.42bis compression.
- **"H1** Enables V.42bis compression in transmit path only.
- **"H2** Enables V.42bis compression in receive path only.
- **"H3** Enables V.42bis bidirectional compression (default).

I Request Product Code I.D. or ROM Checksum

Requests information used for diagnostics.

- **I** Requests your modem's product code I.D.
- **I1** Requests a checksum computed on the firmware ROM. The modem sends three ASCII numeric characters followed by a carriage return and line feed character.

&J Telephone Jack Selection

Selects the type of telephone wall jack being used.

- **&J** Selects RJ-11, RJ-41, and RJ-45S (default).
- **&J1** Selects RJ-12 and RJ-13 (not supported).

\J Automatic Rate Adjust

Controls automatic adjustment of serial port rate to connection rate. Chapter 4 provides more information.

- **\J** Disables rate adjust, allowing computer and connection rates to be different.
- **\J1** Enables rate adjust. Computer rate must match connection rate.

-J Detection Phase Control *Plus Only*

Controls **\N3** and **\N4** detection phase (negotiation).

- **-J** Disables the detection phase.
- **-J1** Enables the detection phase (default).
- **-J2** Enables the detection phase with MNP preferred.

\K Break Processing Control

Controls how a break is processed.

	Break received from DTE while in online state during Reliable or Normal connection	Break received from DTE while in online state during Direct connection	Break received from remote modem in online state during Normal connection	\Bn command received from DTE while in command state during a Reliable or Normal connection
\KØ	Enter command state, do not send break to remote modem	Immediately send break, then enter command state	Purge buffers, immediately send break to DTE	Purge buffers, immediately send break to remote modem
\K1	Purge buffers, immediately send break to remote modem	Immediately send break to remote modem		
\K2	Same as \KØ	Same as \KØ	Immediately send break to DTE	Immediately send break to remote modem
\K3	Immediately send break to remote modem	Same as \K1		
\K4	Same as \KØ	Same as \KØ	Send break to DTE in sequence with data	Send break to remote modem in sequence with data
\K5	Send break to remote modem in sequence with data	Same as \K1		

L Speaker Volume

Selects speaker volume.

- **L** Selects low speaker volume.
- **L2** Selects medium speaker volume (default).
- **L3** Selects high speaker volume.

&L Dial-up Line/Leased Line

Selects dial-up or leased line.

- **&L** Selects dial-up line (default).
- **&L1** Selects leased line (not supported).

\L MNP Stream/Block Link *MNP Only*

Selects stream link.

- **\L** Selects stream link (default).
- **\L1** Selects block link. Operation is identical to stream link operation, except that the maximum block size is 260. This allows compatibility with communications software that attempts to use Microcom block link operation.

M Speaker Control

Turns the speaker on and off.

- **M** Off.
- **M1** On until carrier received (default).
- **M2** Always on.
- **M3** Off while dialing and after carrier is received.

&M Asynchronous/Synchronous Mode Selection

Selects asynchronous or synchronous mode.

&M Asynchronous mode (default).

&M1 Synchronous mode 1. Synchronous mode 1 is used with terminals that can support both synchronous and asynchronous operation. After the call is placed in the asynchronous mode, the modem switches to synchronous. If the **DTR** signal goes from on to off, the modem returns to asynchronous.

&M2 Synchronous mode 2. In synchronous mode 2, a stored number is dialed on an off-to-on transition of **DTR**. This number must be stored in location Ø with an asynchronous terminal using the **&Z*x*=*n*** command. The modem returns to the asynchronous command state on an on-to-off transition of the **DTR** signal.

&M3 Synchronous mode 3. Synchronous mode 3 is for manual dialing. With **DTR** off, dial the number. Then turn **DTR** on and hang up the voice phone. The off-to-on transition of **DTR** must be recognized by the modem before the phone hangs up or the connection will be lost.

\N Operating Mode

Determines the type of asynchronous connection attempted.

\N Normal mode. When **\N** is selected, your modem tries to make a Normal connection. A Normal connection allows flow control (letting your computer rate to be different than the connection rate), but does not use error correction or data compression.

\N1 Direct mode. When **\N1** is selected, your modem attempts to establish a Direct connection with the remote modem. A Direct connection does not use error correction, data compression, or flow control. If the connection is successful, you must change your computer rate to match the connection rate.

\N2 MNP Reliable mode. When **\N2** is selected, after the physical connection is established, the local modem attempts to negotiate an MNP Reliable connection. If it fails, the modem hangs up.

\N3 AutoReliable mode (default). When **\N3** is selected, the local modem attempts to negotiate an MNP or V.42 Reliable connection. If it fails, the modem connects in Normal mode.

\N4 LAPM/MNP Reliable mode. When \N4 is selected, after the physical connection is established, the local modem attempts to negotiate a V.42 or MNP Reliable link. If it fails, the modem hangs up. *Plus Only*

The -J command affects how \N3 and \N4 operate. Do not issue any \N command during an active connection. Chapter 4 provides more information.

%N Maximum DCE Line Connection Rate *Plus Only*

Selects the maximum DCE line connection rate (the maximum rate at which your modem can connect to the remote modem). This can be useful for forcing a connection at a slower speed than would otherwise be used.

- %N Normal operation. Modem connects at highest rate supported by both modems, but does not exceed your computer's rate (default). This is the most commonly used setting.
- %N1 Maximum rate = 300 bps.
- %N2 Maximum rate = 300 bps.
- %N3 Maximum rate = 300 bps.
- %N4 Reserved.
- %N5 Maximum rate = 1200 bps.
- %N6 Maximum rate = 2400 bps.

"N*n* Maximum Dictionary Size *Plus Only*

Controls V.42bis compression routines maximum dictionary size. Under some conditions, adjusting the dictionary size may optimize compression routine efficiency. The value of *n* can be from 512 to 1024 (default = 1024).

O Go Online

Causes the modem to go online.

- O Go online.
- O1 Go online and initiate an equalizer retrain sequence. This form of the command may be used when bit error rates are excessive to reduce errors attributed to loss of equalization. If the errors are due to some other cause, issuing this command will not improve performance. This command form only works at 2400 bps.

\O Originate Reliable Link *MNP Only*

Directs the modem to initiate a Reliable connection regardless of whether the modem originated or answered the call.

If a Reliable connection is already in progress, the modem simply returns online. If the modem fails to establish a Reliable link, the modem returns to a Normal connection regardless of **\N**. The **CONNECT** result code indicates the type of connection established.

"O*n* Maximum String Length *Plus Only*

Controls the maximum string length for V.42bis compression routines. Under some conditions, adjusting the string length may optimize compression routine efficiency. The value of *n* can be from 6 to 250 (default = 16).

&P Select Make/Break Ratio for Pulse Dial

Selects make (off-hook) to break (on-hook) ratio and pulse rates for pulse dialing.

- **&P** Selects 39%/61% make/break ratio (USA/Canada) and 10 PPS (default).
- **&P1** Selects 33%/67% make/break ratio (UK/Hong Kong) and 10 PPS.
- **&P2** Selects 39%/61% make/break ratio (USA/Canada) and 20 PPS.
- **&P3** Selects 33%/67% make/break ratio (UK/Hong Kong) and 20 PPS.

Q Enable/Disable Result Codes

Determines whether result codes are returned to acknowledge commands and actions.

- **Q** Causes result codes to be returned (default).
- **Q1** Disables result codes.

\Q Serial Port Flow Control

Flow control can affect the flow of data between your computer and your modem OR between your modem and the remote modem. The \Q command controls data flow between your computer and modem (that is, over the serial port) during Normal or Reliable connections.

\Q	Disables flow control (default).
\Q1	Enables XON/XOFF flow control.
\Q2	Enables unidirectional hardware flow control.
\Q3	Enables bidirectional hardware flow control.

Chapter 4 provides an overview of flow control.

Software Flow Control (XON/XOFF) — \Q1

You can use this method for ASCII text communication, such as reading mail, browsing directories, etc. Do NOT use this method if you want to transfer anything other than ASCII text, including binary files (programs or compressed files).

With software flow control, an XOFF character (CTRL-S) is sent when data flow is to be paused, and an XON character (CTRL-Q) is sent when data flow is to resume.

If a Reliable or Normal connection has been made, and software flow control (**\Q1**) is enabled on your modem, the following will automatically happen:

- *If your send buffer fills:* Your modem sends an XOFF character to your computer. Then your computer stops sending data to your modem, and does not resume until your modem sends your computer an XON character, indicating the buffer is no longer full.
- *If your receive buffer fills:* When your computer cannot continue receiving data, it sends your modem the XOFF character. Then your modem stops sending data to your computer. When your computer is ready to start receiving data again, it sends your modem an XON character. Then your modem starts sending data to your computer again.

Do not use **\X1** (pass XON/XOFF characters through) and **\Q1** together. Doing so causes the remote modem to receive XON/XOFF characters intended for your modem, and will likely cause data to be lost.

Telecommunications Software XON/XOFF Flow Control

Most telecommunications software also lets you send XON/XOFF characters yourself, either from the keyboard (using CTRL-S and CTRL-Q), or by some other method. Refer to your software manual for more information on using its XON/XOFF feature.

Hardware Flow Control — \Q2 & \Q3

*Bidirectional hardware flow control (**\Q3**) works for any type of data transfer. For transferring binary data files (programs or compressed files) using Reliable connections, hardware flow control is required.*

Hardware flow control is similar to software flow control, except that instead of XON/XOFF characters, changing serial port **CTS** and **RTS** signals stop and start data flow between your modem and your computer.

- Unidirectional flow control (**\Q2**) only controls computer-to-modem data flow. Modem-to-computer data flow is not controlled.
- Bidirectional flow control (**\Q3**) controls both computer-to-modem and modem-to-computer data flow.

&R Request-to-Send (RTS)/Clear-to-Send (CTS)

In asynchronous mode, **CTS** is always on in both the command and on-line states, and this command has no effect.

In synchronous mode, **&R** (default) sets **CTS** to turn on (after the delay specified in S26) in response to an off-to-on transition of **RTS**. Synchronous data received while **CTS** is off is ignored.

In synchronous mode, **&R1** sets the modem to ignore **RTS**. The modem turns on **CTS** when it is online and ready to receive synchronous data. **CTS** remains on until the modem hangs up. This mode is not used for half-duplex operation.

S*r*? Read S Registers

Displays the value in register *r* at your computer. The value in *r* must be a valid S register number.

The following example command causes the value (20) in S register 1 to be displayed on the screen.

AT S1? [CR]

Ø2Ø (from modem)

OK (from modem)

Chapter 7 provides more information on this command.

S*r*=*n* Write to S Registers

Sets the value in S register *r* to *n*. The value in *r* must be a decimal integer from Ø to 27, 31, 37, or 100 that represents an S register. The value in *n* must be a decimal integer from Ø to 255.

The following example command sets the value in S register 4 to 9 and the value in S register 26 to 30:

AT S4=9 S26=30 [CR]

Chapter 7 provides additional information on this command.

&S Select Action of Data-Set-Ready (DSR)

Determines the function of the Data-Set-Ready interactive circuit (**DSR**) — RS-232C pin 6.

- **&S** Causes **DSR** to remain on whenever the modem is on (default).
- **&S1** Causes **DSR** to operate according to the CCITT V.22/V.22bis recommendation.

\S Show Active Configuration Profile

Displays modem's active configuration profile. Your modem's settings might be different than those shown here. The Supra-Modem 2400 Plus displays additional settings (not shown). For more information, refer to the descriptions of the commands listed.

```
CONNECTION              IDLE
MODEM BPS               IDLE
MODEM FLOW              OFF             AT\G0
MODEM MODE              DIRECT          AT\N1
SERIAL BPS              1200
BPS ADJUST              ON              AT\J1
SERIAL FLOW             OFF             AT\Q0
PASS XON/XOFF           OFF             AT\X0
 - STRIKE ANY KEY TO CONTINUE -

PARITY                  7 SPACE/8 NONE
BREAK                                   AT\K5
CMD ECHO                ON              ATE1
RESULT CODES            ON              ATQ0
RESULT TYPE             LONG            ATV1\V0
COMPRESSION             ON              AT%C1
DTR                                     AT&D2
CARRIER DETECT                          AT&C1
 - STRIKE ANY KEY TO CONTINUE -

SPEAKER CNTRL                           ATM1
LEASED LINE             OFF             AT&L0
MAX BLOCK SIZE          256             AT\A3
ASYNC/SYNC              ASYNC           AT&M0
CTS/RTS                 ON              AT&R0
RDLB ENABLE             ON              AT&T4
DIAL MODE                               ATX4
PULSE DIAL              US 10-PPS       AT&P0
AUTOREL BUFFER          OFF             AT\C0
 - STRIKE ANY KEY TO CONTINUE -

GUARD TONE              OFF             AT&G0
BELL                    ON              ATB1
ESCAPE CHAR             043             ATS2
INACT TIMER             000             AT\T
AUTO ANSWER             OFF             ATS0=000
AUTO-FB CHAR            000             AT%A
PAUSE TIME              002             ATS8

PHONE # 0
PHONE # 1
PHONE # 2
PHONE # 3
OK
```

Sample \S Listing

&T Test Modem

Allows trained technicians to test the modem. (Refer to Chapter 9 for help solving problems.) To avoid errors, issue the **&F** command, set **S18** test length, and connect to a remote modem before using any form of the **&T** command.

- **&T** Terminates any test currently in progress. This command must be the last one in the command line.
- **&T1** Local analog loopback.
- **&T3** Local digital loopback.
- **&T4** Allows the local modem to grant a request from the remote modem for a remote digital loopback test.
- **&T5** Prohibits local modem from granting a request from the remote modem for a remote digital loopback test.
- **&T6** Remote digital loopback .
- **&T7** Remote digital loopback with self-test.
- **&T8** Local analog loopback with self-test.

\T*n* Set Inactivity Timer

Controls how long the modem will stay connected with no data communications activity. The value of *n* can be Ø to 90 minutes, with Ø disabling the timer (default = Ø). After *n* time has elapsed, the modem disconnects. This timer is ignored in Direct mode.

\U Accept MNP Reliable Connection *MNP Only*

When your modem is already connected to a remote modem, directs your modem to accept an MNP Reliable connection request regardless of whether it originated or answered the call.

If a Reliable connection already exists, the modem simply returns online. If the modem fails to establish a Reliable connection, the modem returns to a Normal connection. The **CONNECT** result code indicates the type of connection established.

V Choose Verbose or Numerical Result Codes

Determines whether result codes are displayed as decimal numbers or as words.

V	Causes result codes to be displayed as numbers.
V1	Causes result codes to be displayed as words (default).

The section called "Result Codes" in Chapter 3 explains result codes, and Appendix B provides a complete list of result codes, their verbose and numerical representations, and their meanings.

\V Reliable Result Codes

Enables extended result codes. Appendix B lists and explains all the standard and extended result codes.

\V	Returns standard result codes (default).
\V1	Returns MNP extended result codes.
\V2	Returns V.42bis extended result codes. ***Plus Only***

&W*n* Write Active Configuration to Nonvolatile Memory

Stores the active configuration profile in nonvolatile memory location ***n***. One or two profiles can be stored. The value in ***n*** can be Ø or 1. If a value for ***n*** is omitted, Ø is assumed. When the modem is turned on or reset, the profile in memory location Ø is loaded, unless the **&Y*n*** command has been issued. You can also reset the modem and load one of these configurations by issuing the **Z*n*** command. Chapter 6 provides a list of the registers that are saved, and further information on the **&W*n*** command.

X Dialing and CONNECT Result Codes

Selects the type of dialing and **CONNECT** result codes the modem uses. The modem can either wait for a dial tone or blind dial (automatically dial regardless of whether a dial tone is present). If the modem waits for a dial tone, it will send the **NO DIALTONE** message if it does not detect a dial tone within the time set in **S6** (default = 5 seconds). **X4** is the default.

Command	Blind Dial	Recognize Busy Signal	Send CONNECT Result Code
X	yes	no	CONNECT only
X1	yes	no	any CONNECT message
X2	no; wait for dial tone, then dial	no	any CONNECT message
X3	yes	yes; if detect busy signal, send BUSY	any CONNECT message
X4	no; wait for dial tone, then dial	yes; if detect busy signal, send BUSY	any CONNECT message

&X Synchronous Transmit Clock Source

Determines synchronous transmit clock source. For synchronous operation, the modem requires the transmit data (TXD) to be synchronized to a clock signal.

- **&X** Modem generates transmit clock timing and supplies it to the RS-232 connector pin 15 (TCLK).
- **&X1** DTE supplies an external transmit clock on RS-232 pin 24 (XTCLK).
- **&X2** The transmit clock is derived from the data carrier received from the remote modem, and then supplied on RS-232 pin 15.

\X Set XON/XOFF Pass-Through

Controls whether XON/XOFF characters are passed through the SupraModem to either the remote modem (when sending) or your computer (when receiving).

- **\X** Recognize XON/XOFF characters but do not pass them through (default).
- **\X1** Recognize XON/XOFF characters and pass them through. This setting only affects Normal connections.

Do not use **\X1** and **\Q1** (XON/XOFF serial port flow control) together. Doing so causes the remote modem to receive XON/XOFF characters intended for your modem, and will likely cause data to be lost.

Enable pass-through when your software and the remote modem's software are both using XON/XOFF to control data flow between the modems. Disable pass-through when using XON/XOFF to control flow control between your computer and your modem.

Y Enable/Disable Long Space Disconnect

Enables or disables a long space disconnect.

- **Y** Disable long space disconnect (default).
- **Y1** Enable long space disconnect. In this case, the modem disconnects when it receives a space of 1.6 seconds or more, and it will send a 4-second long space disconnect signal before hanging up (**H** command) or on an ON-to-OFF transition of **DTR** (**&D2** command).

&Y*n* Load Configuration Profile at Power-Up

Causes a stored configuration to be loaded when you switch the modem on or reset the modem, or upon **&D3 DTR** transition. The value of *n* can be Ø or 1, representing memory location Ø or 1. If a value for *n* is omitted, Ø is assumed.

\Y Establish an MNP Reliable Connection *MNP Only*

Causes the modem to try to establish an MNP Reliable connection after making a Normal or Direct connection. If a Reliable connection already exists, the modem returns online.

Z*n* Reset and Load Stored Configuration

Resets the modem and loads the active configuration area with the configuration profile stored in nonvolatile memory location *n*. The value in *n* can be Ø or 1; if a value for *n* is omitted, Ø is assumed. When the modem is turned on or reset, the profile in location Ø is loaded unless the **&Y***n* command has been used to specify

&Z*x=n* Store Telephone Number

Stores the telephone number *n* in nonvolatile memory location *x* for subsequent dialing using the **D** command with the **S***x* modifier.

The value in *x* can be Ø, 1, 2, or 3, allowing you to store up to 4 telephone numbers. If no value for *x* is supplied, Ø is assumed.

The number in *n* must be an ASCII string containing numbers Ø through 9 (for pulse phone lines) or those numbers and the characters A, B, C, D, #, and * (for touch-tone phone lines). It can include any of the dial command modifiers except **S***x*. The length of *n* cannot exceed 30 characters excluding the AT prefix, the carriage return, and the line feed character.

Both the equal sign (=) and a value for *n* are required. Chapter 5 provides more information on using stored telephone numbers.

\Z Switch to Normal Mode *MNP Only*

Causes the local and remote modem to switch from an MNP Reliable connection to a Normal connection. Any data in buffers is lost. Either one or both modems may issue the **\Z** command to fall back to Normal mode.

B

RESULT CODE DESCRIPTIONS

Standard Result Codes (\VØ)

These result codes are returned when the **\VØ** command has selected standard result codes. These result codes are the default with the **&FØ** factory setting.

Code	Number	Meaning
BUSY	7	Busy signal detected.
CONNECT	1	300 bps connection.
CONNECT 1200	5	1200 bps connection.
CONNECT 2400	10	2400 bps connection.
ERROR	4	Error in command line, or command line exceeds command buffer.
NO ANSWER	8	Remote modem did not answer phone within timeout period specified by S7, or @ dial modifier was issued and less than 5 seconds of silence detected.
NO CARRIER	3	Failed to connect, or loss of carrier.
NO DIALTONE	6	No dial tone signal detected. Enabled by the X2 or X4 command or the W dial command modifier.
OK	Ø	Command line executed without errors.
RING	2	Ring signal detected.

MNP Extended Result Codes (\V1) *MNP Only*

When the **\V1** command has been used to select MNP extended result codes, the following **CONNECT** result codes are used in addition to the standard result codes. *Note:* **\V1** is part of the **&F2** factory setting.

These **CONNECT** result codes indicate your modem has connected to a remote modem and show the physical, error correction, and/or data compression protocols used.

Code	Number	Line Rate	Physical Protocol	DC/EC Protocol
CONNECT V21/ REL	20	300 bps	V.21	MNP
CONNECT 103/ REL	20	300 bps	Bell 103	MNP
CONNECT 1200/ REL	22	1200 bps	Bell 212 or V.22	MNP
CONNECT 2400/ REL	23	2400 bps	V.22bis	MNP

V.42bis Extended Result Codes (\V2) *Plus Only*

When the **\V2** command has been used to select V.42bis extended result codes, the following **CONNECT** result codes are used in addition to the standard result codes.

These **CONNECT** result codes indicate your modem has connected to a remote modemand show the physical, error correction, and/or data compression protocols used.

Code	#	Line Rate	Physical Protocol	DC/EC Protocol
CONNECT V21/ REL-MNP	20	300 bps	V.21	MNP 2-4
CONNECT V21/ REL-MNP-COMP	20	300 bps	V.21	MNP 5
CONNECT V21/ REL-LAPM	20	300 bps	V.21	LAPM
CONNECT V21/ REL-LAPM-COMP	20	300 bps	V.21	LAPM & BTLZ
CONNECT 103/ REL-MNP	20	300 bps	Bell 103	MNP 2-4
CONNECT 103/ REL-MNP-COMP	20	300 bps	Bell 103	MNP 5
CONNECT 103/ REL-LAPM	20	300 bps	Bell 103	LAPM
CONNECT 103/ REL-LAPM-COMP	20	300 bps	Bell 103	LAPM & BTLZ
CONNECT 1200/ REL-MNP	22	1200 bps	Bell 212 or V.22	MNP 2-4
CONNECT 1200/ REL-MNP-COMP	22	1200 bps	Bell 212 or V.22	MNP 5
CONNECT 1200/ REL-LAPM	22	1200 bps	Bell 212 or V.22	LAPM
CONNECT 1200/ REL-LAPM-COMP	22	1200 bps	Bell 212 or V.22	LAPM & BTLZ
CONNECT 2400/ REL-MNP	23	2400 bps	V.22bis	MNP 2-4
CONNECT 2400/ REL-MNP-COMP	23	2400 bps	V.22bis	MNP 5
CONNECT 2400/ REL-LAPM	23	2400 bps	V.22bis	LAPM
CONNECT 2400/ REL-LAPM-COMP	23	2400 bps	V.22bis	LAPM & BTLZ

C

S REGISTER DESCRIPTIONS

The following sections describe the S registers in detail.

SØ Number of Ring to Answer
(range = Ø–255; Ø = disabled; default = Ø)

Contains the number of rings the modem waits for before it answers. A value from 1 to 255 enables the modem's auto answer mode (refer to Chapter 5 for more information about auto answer). A value of Ø disables auto answer.

The **AA** light on the front of the external modem acts differently if auto answer is enabled or disabled. When auto answer is enabled, **AA** is usually lit but goes off during an incoming call's rings. When auto answer is disabled, **AA** is usually off but goes on during an incoming call's rings.

S1 Ring Counter
(range = Ø–255; default = Ø)

Holds the current number of telephone rings. This register is used to count the number of telephone rings and is set back to Ø if it detects no rings for eight seconds.

S2 Escape Code
(range = Ø–255; default = 43 "+")

Contains the ASCII value of the escape code. This register can be set to any value from Ø to 255, but values greater than 127 will cause the escape code to be disabled. Chapter 3 provides additional information on the escape code.

S3 Carriage Return
(range = Ø–127; default = 13)

Contains the ASCII value of the carriage return control character. This character serves as the command line terminator and the result code terminator. If the data terminal is non-standard, a value other than 13 can be used in this register.

S4 Line Feed
(range = Ø–127; default = 10)

Contains the ASCII value of the line feed control character.

S5 Backspace
(range = Ø–33; default = 8)

Contains the ASCII value of the backspace control character (8). The value in this register must be from Ø to 33.

S6 Time to Wait for Dial Tone
(range = Ø–255; default = 2; units = seconds)

Holds a value indicating the maximum time to wait for a dial tone after going off-hook before dialing a telephone number. The modem will dial the number as soon as it has detected a dial tone, or it will return the **NO DIALTONE** result code if it does not detect a dial tone within the period specified in **S6**. This only applies when the **X2** or **X4** command has been used.

S7 Time to Wait for Ring-back/Carrier
(range = 1–30; default = 30; units = seconds)

Holds a value from 1 to 30 indicating the maximum time the originating modem waits for one of the following before hanging up:

- a ring-back (the ringing that occurs on your end after dialing a telephone number)
- a carrier from the remote modem

The SupraModem looks for a carrier even if a ring-back is not detected before the time limit; if no carrier appears, this may cause a wait of up to twice the value in **S7**. This only applies when the **X3** or **X4** command has been used.

S8 Pause Time for Dial Command Comma Modifier
(range = Ø–255; default = 2; units = seconds)

Holds a value from Ø to 255 that represents the length of the pause caused by a comma in the dial command string (D).

S9 Time to Wait Before Recognizing Carrier
(range = Ø–255; default = 6; units = 1/10 seconds)

Holds a value from Ø to 255 that represents the length of time after a carrier first appears that the modem should wait to recognize that carrier as valid and turn on the Data-Carrier-Detect (DCD) interchange circuit. This delay allows the SupraModem to ignore spurious signals that are the same frequency as the carrier tone. As the time is increased, the chance of a false carrier being detected is reduced.

S10 Delay from Lost Carrier to Hang Up
(range = Ø–255; default = 14; units = 1/10 second)

Holds a value from 1 to 255 that represents the amount of time your modem will wait for a valid carrier to return before disconnecting. A long enough time allows the remote modem's signal to momentarily disappear without causing the SupraModem to disconnect.

The actual time the SupraModem will wait for a lost carrier to appear after it disappears is the difference between **S9** and **S10**. A value of 255 causes the SupraModem to act as though a carrier were always present, whether one is or not.

S11 DTMF Tone Duration/Spacing
(range = 50–255; default = 100; units = 1/1000 second)

Holds a value from 50 to 255 ms. that represents the spacing between and duration of the DTMF (dial) tones during tone call progress. The spacing between tones is equal to the duration of each tone. If an attempt is made to set **S11** to a value less than 50, **S11** assumes a value of 50.

S12 Escape Code Guard Time
(range = Ø, 20–255; Ø disables timer; default = 50; units = 1/50 second)

Holds a value from 20 to 255 (5.1 seconds) that represents the delay required before and after entering the escape code.

S13 Reserved

S14 Bit Mapped Options

Bit	Use	Setting	
Ø	Reserved		
1	Command echo (see E command)	Ø	Disabled
		1	Enabled (default)
2	Result codes (see Q command)	Ø	Enabled (default)
		1	Disabled
3	Result code words or numbers (see V command)	Ø	Numbers
		1	Words
4	Dumb/Smart (determined by D-S header)	Ø	Smart (default)
		1	Dumb
5	Dial method (Indicates whether last dial string used P or T modifier)	Ø	Tone
		1	Pulse
6	Reserved		
7	Originate/Answer	Ø	Answer
		1	Originate (default)

S15 Reserved

S16 Diagnostic Test Modes

(default = Ø)

Bit	Use	Setting	
Ø	Local analog loopback (see &T1 command)	Ø	Disabled (default)
		1	Enabled
1	Reserved		
2	Local digital loopback (see &T3 command)	Ø	Disabled (default)
		1	Enabled
3	Remote digital loopback (see &T4 and &T5 commands)	Ø	Disabled (default)
		1	Enabled
4	Remote digital loopback (see &T6 command)	Ø	Disabled (default)
		1	Initiate
5	Remote digital loopback with test message and error count (see &T7 command)	Ø	Disabled (default)
		1	Initiate
6	Local analog loopback with self-test (see &T8 command)	Ø	Disabled (default)
		1	Enabled
7	Reserved		

Note the following:

- Only one of the above tests can be performed at one time.
- The **&T** command terminates any test in progress and sets **S16** to Ø.

S17 Reserved

S18 Test Timer

(range = Ø–255; Ø disables timer; default = Ø; units = seconds)

Holds a value that represents the duration of modem diagnostic tests. When a test is active for a period equal to the value in this register, the modem automatically cancels the test. A test can be terminated from the command state at any time by issuing the **&T** command.

S19 Reserved

S20 Reserved

S21 Bit Mapped Options
(default = Ø)

Bit	Use	Setting	
Ø	Telephone jack (see &J command)	Ø	RJ-11/RJ-41S (default)
		1	RJ-12/RJ-13
1	Reserved		
2	Clear-to-Send (CTS) (applies to synchronous mode only; see &R)	Ø	CTS follows RTS (default)
		1	CTS follows carrier signal
4, 3	Data-Terminal-Ready (DTR) (see &D command)	Ø, Ø	Modem ignores DTR
		Ø, 1	Modem goes to command state if ON-to-OFF transition of DTR
		1, Ø	Modem hangs up with ON-to-OFF transition of DTR (default)
		1, 1	Modem re-initializes if ON-to-OFF transition of DTR
5	Data-Carrier-Detect (DCD) (see &C command)	Ø	DCD always on
		1	DCD on when carrier is present (default)
6	Data-Set-Ready (DSR) (see &S command)	Ø	DSR always on (default)
		1	When DSR on, modem is off-hook, in data mode, and not in self-test mode
7	Long space disconnect (see Y command)	Ø	Disabled (default)
		1	Enabled

S22 Bit Mapped Options

Bit	Use	Setting	
1, Ø	Speaker volume (see L command)	Ø, Ø	Undefined
		Ø, 1	Low
		1, Ø	Medium (default)
		1, 1	High
3, 2	Speaker control (see M command)	Ø, Ø	Disabled
		Ø, 1	On until carrier detected (default)
		1, Ø	Always on
		1, 1	Off during dialing and then on until carrier detected
6, 5, 4	Result code options (see X command)	Ø, Ø, Ø	X
		1, Ø, Ø	X1
		1, Ø, 1	X2
		1, 1, Ø	X3
		1, 1, 1	X4 (default)
7	Make/break ratio (see &P command and S31)	Ø	39/61 U.S./Can. (default)
		1	33/67 U.K./Hong Kong

S23 Bit Mapped Options
(default = 7)

Note: The default settings for register **S23** vary depending on your computer's RS-232 port settings. Specifically, your rate and parity defaults may be different than those listed here.

Bit	Use	Setting	
Ø	Obey request from remote modem for remote digital loopback (see &T4 and &T5 commands)	Ø	Disabled
		1	Enabled (default)
3, 2, 1	DTE communication rate (see AT command line prefix)	Ø, Ø, Ø	Ø to 300 bps
		Ø, Ø, 1	600 bps
		Ø, 1, Ø	1200 bps
		Ø, 1, 1	2400 bps (default)
		1, Ø, Ø	4800 bps
		1, Ø, 1	9600 bps
5, 4	Parity option (see AT command line prefix)	Ø, Ø	Even (default)
		Ø, 1	Space
		1, Ø	Odd
		1, 1	Mark/None
7, 6	Guard tones (see &G command)	Ø, Ø	Disabled (default)
		Ø, 1	550 Hz tone
		1, Ø	1800 Hz tone
		1, 1	Not used

S24 Reserved

S25 Delay to DTR

(range = Ø–255; default = 5; units = 1/100 second)

Holds a value serving as the shortest length of a Data-Terminal-Ready (**DTR**) ON-to-OFF change the modem recognizes.

If you use the **&D2** command to cause the modem to hang up when it detects an on-to-off transition on **DTR**, the modem will not hang up if this transition is shorter than the value in **S25**. For more information, refer to the **&D** command description in Appendix A.

S26 RTS/CTS Delay

(range = Ø–255; default = 1; units = 1/100 second)

Holds a value representing the delay after an off-to-on transition of **RTS** before **CTS** is asserted.

S27 Bit Mapped Options

Bit	Use	Setting	
1, Ø	Asynchronous/ synchronous (see &M command)	Ø, Ø	Asynchronous (default)
		Ø, 1	Synchronous 1, asynchronous dial
		1, Ø	Synchronous 2, DTR dial
		1, 1	Synchronous 3, manual dial
2	Dial-up/leased line (see &L command)	Ø	Dial-up (default)
		1	Leased (not supported)
3	Reserved		
5, 4	Synchronous clock source (see &X command)	Ø, Ø	TCLK - pin 15 (default)
		Ø, 1	XTCLK - pin 24
		1, Ø	From received carrier
		1, 1	Reserved
6	300/1200 bps protocol (see B command)	Ø	CCITT V.21/V.22
		1	Bell 103/212A (default)
7	Reserved		

S31 Bit Mapped Options
(default = 11)

Bit	Use	Setting	
2, 1, Ø	Reserved — Do Not Change From Ø, Ø, Ø		
4, 3	Reserved — Do Not Change From Ø, Ø		
5	Pulse dialing (see &P command)	Ø	10 PPS (default)
		1	20 PPS
6	DTR (see &D4 command)	Ø	Normal DTR (default)
		1	DTR/async. dialing
7	Configuration profile to load on power up (see &Y command)	Ø	Profile Ø (default)
		1	Profile 1

S37 Maximum DCE Line Speed *Plus Only*
(range = Ø–6; default = Ø)

Holds a value from Ø to 6 that represents the highest rate at which your modem will attempt to connect with a remote modem:

Ø	The speed of the last **AT** command issued (default)
1, 2 or 3	300 bps
4	Reserved
5	1200 bps
6	2400 bps

S100 Mean Error *Plus Only*
(default = Ø)

Mean squared error. May be used to compare quality of one line to another. Higher numbers indicate worse connections, and lower numbers indicate better connections.

D

RS-232C PIN ASSIGNMENTS

This appendix explains the RS-232C pins on external modems.

Summary

Pin	EIA	Abbrev.	Source	Description
1	AA	shield	n/a	protective ground
2	BA	TXD	DTE	transmit data
3	BB	RXD	DCE	receive data
4	CA	RTS	DTE	request to send
5	CB	CTS	DCE	clear to send
6	CC	DSR	DCE	data set ready
7	AB	GND	n/a	signal ground
8	CF	DCD	DCE	data carrier detect
12	CI	SI	DCE	data speed indicator
15	DB	TCLK	DCE	transmit clock (sync. only)
17	DD	RCLK	DCE	receive clock (sync. only)
20	CD	DTR	DTE	data terminal ready
22	CE	RI	DCE	ring indicator
24	DA	XTCLK	DTE	external transmit clock (sync. only)

Detailed Circuit Descriptions

1 Protective Ground

This pin is electrically bonded to the SupraModem shell.

2 Transmit Data (TXD)

Your computer sends serial data to the modem on this pin.

3 Receive Data (RXD)

The modem transmits data to your computer on this pin.

4 Request-to-Send (RTS)

If bidirectional hardware flow control is enabled (**\Q3**), the modem stops sending data to your computer if your computer drops this signal. An **RTS** signal from your computer tells the modem to assume the data channel transmit mode. The modem response on the **CTS** pin (5) depends on the **&R** command and whether the modem is in synchronous mode.

5 Clear-to-Send (CTS)

CTS indicates that the modem is prepared to accept data signals for transmission or for maintenance tests. When hardware flow control (**\Q2** or **\Q3**) is selected, this signal turns off to tell your computer to stop sending data to the modem when the buffers are full.

In synchronous mode, when the modem is in command state, it forces an on condition at this pin. Once the modem goes off-hook, this pin goes off until **DSR** and **DCD** are on and the modem is ready to transmit and receive synchronous data. The **&R** command causes this pin to turn on in response to an OFF-to-ON transition of **RTS** after the delay in **S26**.

6 Data-Set-Ready (DSR)

The **&SØ** command causes the modem to keep **DSR** on at all times (indicating the modem is ready to exchange control signals with your computer to initiate additional data transfers).

The **&S1** command allows this pin to monitor the modem in the originate mode to indicate that dialing is complete and an answer tone has been detected. In answer mode, **DSR** on indicates that the modem is ready for data.

7 Signal Ground (GND)

Pin 7 is a common reference for all signals on the connector.

8 Data-Carrier-Detect (DCD)

The SupraModem can be programmed to keep **DCD** on regardless of data carrier (**&C**), or to cause **DCD** to indicate the presence of a suitable data carrier from the remote modem (**&C1** — default). The **&C** command description in Appendix A has more information.

12 DTE Speed Indicator (SI)

SI indicates one 1 of 2 DTE speed ranges. A low signal indicates 2400–9600 bps and a high signal indicates 0–1200 bps.

15 Transmit Clock (TCLK) *Synchronous Only*

This clock output from the modem acts as the timing for the serial data exchange from the computer to the modem, when operating in synchronous mode and configured for internal clock (**&X** or **&X2**) timing. The frequency is accurate to within .01% of the nominal data rate. The controller reads the serial synchronous transmit data on the rising edges of the **TCLK**.

17 Receive Clock (RCLK) *Synchronous Only*

The receive clock output from the modemis synchronous with the received serial data (**RXD**), with the rising edge of the clock occurring near the middle of each data bit. This pin is off in asynchronous mode.

20 Data-Terminal-Ready (DTR)

The SupraModem can be programmed one of four ways: to ignore **DTR**, to assume command state if an on-to-off transition on **DTR**, to go on-hook and disable auto answer if an on-to-off transition on **DTR**, or to initialize if an on-to-off transition on **DTR**. The **&D** command description in Appendix A has more information.

22 Ring Indicator (RI)

The modem turns this circuit on during an incoming ring.

24 Transmit Clock Source (XTCLK) (Synchronous Only)

This signal provides an external transmit clock from the DTE to synchronize **TCLK** when the **&X1** clock source is selected. The controller samples **TXD** on the rising edge of **XTCLK**.

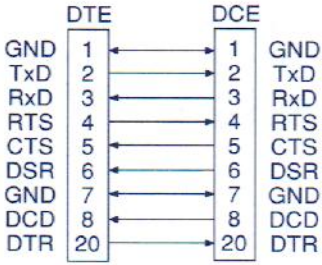
E

EXTERNAL MODEM CABLES

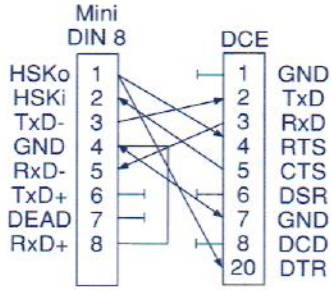
If you have an external modem, you need to connect the modem to your computer using a cable that meets the following requirements. If you need assistance, please contact your local computer dealer.

- It must be a shielded RS-232C cable with a DB-25P (male) connector on one end and a connector for attaching the cable to your computer's serial port on the other end. (Your computer manual should tell you what type of serial port your computer has.)
- For most personal computers, it should be a straight-through DCE-to-DTE cable.
- To take full advantage of data compression, your cable should have pins 4 (**RTS**) and 5 (**CTS**) lines wired for hardware handshaking. Most modem cables meet this condition, but some cables, particularly for Macintosh computers, do not. The diagrams below show how cables for different computers need to be wired for successful operation using hardware handshaking.

Standard RS-232C Cable
Works on Most Computers



Cable for Apple IIGS &
Macintosh Computers (Except 512)



⊢ = *not connected*

F

SUPRAMODEM SPECIFICATIONS

Compatible with these asynchronous and synchronous modems:

- CCITT V.21 and Bell 103 at 300 bps
- CCITT V.22 and Bell 212A at 1200 bps
- CCITT V.22bis at 2400 bps
- MNP classes 2-5
- CCITT V.42 (with LAPM) and V.42bis (BTLZ) *Plus Only*

Asynchronous data formats:

Start bits	Data bits	Parity	Stop bits
1	7	even or odd	1 or more
1	7	none	2
1	7	mark or space	1 or more
1	8	none	1 or more

Test and diagnostic facilities:

- local digital loopback
- remote digital loopback
- programmable test timer
- local analog loopback
- remote digital loopback with self test
- local analog loopback with self test

Call progress monitoring features:

- wait for dial tone before dialing (sends **NO DIALTONE** code)
- detect busy (sends **BUSY** result code)
- wait for silence after answer
- detect answer tone

Forty-character command buffer.

One-inch speaker with adjustable volume.

Dial features:

- tone or pulse dial
- ability to dial four (4) stored telephone numbers
- programmable pauses
- wait for dial tone before dialing
- wait for silence after answer
- originate call from modem in answer mode
- hook-flash
- tone (DTMF) symbols Ø, 1, 2, 3, 4, 5, 6, 7, 8, 9, #, *, A, B, C, D

Result codes listed in Appendix B.

User-modifiable, nonvolatile RAM stores one or two custom configurations. Chapter 6 lists the settings these configurations contain.

Programmable escape code sequence for going from online to command state without hanging up.

Separate telephone line and telephone set connectors.

Data encoding:

- 2400 bps (V.22bis) — Quadrature Amplitude Modulation (QAM): 16 possible symbols of combinations of 12 phase angles and 3 amplitudes. Each symbol conveys 4 bits (quadbits). Signaling rate is 600 symbols per second.
- 1200 bps (V.22 and Bell 212A) — Differential Phase Shift Keying (DPSK): 4 possible symbols consist of 1 of 4 phase angles. Each symbol conveys 2 bits (dibits). Signaling rate is 600 symbols per second.
- Ø to 300 bps (V.21 and Bell 103) — Frequency Shift Keying (FSK): One bits and zero bits are assigned specific frequencies in transmit and receive directions. Signaling rate equals bit rate.

Equalization:

- fixed compromise equalization in the transmitter
- adaptive equalization in the receiver

Power consumption:	External SupraModem	2.5 watts
	Internal SupraModem	1.5 watts

Sizes:	External SupraModem measures	1" x 4-5/8" x 6-1/2"
	Internal SupraModem	5-1/2" x 4-1/4"

Additional External Modem Features

Power pack output 9 VAC/500 ma.

RS-232C terminal interface.

Indicator lights described in Chapter 1.

G

FCC & DOC RULES

Federal Communications Commission (FCC)

The SupraModem has been tested and found to comply with the limits for a Class B computing device according to the specifications in FCC rules Part 68. As an owner and/or operator of a registered modem like the SupraModem, you must comply with these rules:

- Before installing your modem, you must notify your telephone company that you are going to install an FCC registered device. When you contact them, you must provide the FCC registration number and ringer equivalence number (REN) for your modem; these numbers are listed below.
- You cannot connect the SupraModem to a party line or to a coin telephone line.
- You must only connect your modem to a standard modular telephone jack, type RJ-11.
- If your SupraModem needs repairs, you must arrange for Supra Corporation to make them if you are to keep the modem's FCC registration valid.
- You must use a shielded RS-232C cable to connect your external modem to your terminal.

This equipment, like other electronic equipment, generates and uses radio frequency energy. If not installed and used according to the instructions in this manual, this equipment may cause interference with your radio and television reception.

If you believe that this equipment is causing interference with your radio or television reception, try turning the equipment off and on. If the interference problems stop when the equipment is switched off, then the equipment is probably causing the interference. You may be able to correct the problem by doing one or more of the following:

- Adjust the position of the radio or TV antenna.
- Move the modem away from the radio or TV.
- Plug the modem into a different outlet than the radio or TV uses.

If necessary, consult your dealer or an experienced radio or television technician. You may find this booklet helpful: "How to Identify and Resolve Radio and TV Interference Problems" (Stock No. 004-000-00345-4), prepared by the FCC and available from the U.S. Government Printing Office, Washington, DC 20402. See individual modems for FCC ID and registration numbers.

Canadian Department of Communications (DOC)

The DOC label identifies certified equipment. Certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The DOC does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, ensure that it is permissible to be connected to the facilities of the local telecommunications company. Install the equipment using an acceptable method of connection. Service may be extended by means of a certified connector assembly (telephone extension cord). Compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

For your own protection, ensure the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Do not attempt to make such connections yourself. Contact the electric inspection authority, or electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100. An alphabetic suffix is also specified in the Load Number for the appropriate ringing type (A or B), if applicable. For example, LN = 17A designates a Load Number of 17 and an "A" type ringer. Load Numbers and ringer types can be found on a sticker on the modem.

GLOSSARY

AutoReliable Mode — The mode in which the modem makes the best possible connection, whether Reliable or Normal.

CCITT V.42 — The international standard protocols for error correction (MNP 2-4 and **LAPM**).

CCITT V.42bis — The international standard protocols for error correction (MNP 2-4 and LAPM) and 4:1 data compression (**BTLZ**).

Connection Rate — The rate at which two modems communicate over a telephone line. *Synonyms:* **Transmission Speed**, **Line Speed**, **Modem-Modem Speed**, **DCE-DCE Rate**.

Command State — When your modem will accept AT commands. *Synonym: Escape State. See also Online State.*

Computer Rate — The rate at which a modem (DCE) and a computer (DTE) communicate. This is what changes when you set communications rate in your telecommunications software. *Synonyms:* **Serial Port Rate**, **Modem-Computer Speed**, **DTE-DCE Rate**, **Communications Rate**.

Data Compression — The process of reducing the size of data parcels to transmit more data in less time. *See also Error Correction/Data Compression Protocols.*

DCE — Data Communications Equipment. Your modem. *See also DTE.*

Direct Connection

Any standard modem connection, without error correction, data compression, or flow control. In a Direct connection, the computer rate must equal the connection rate. For example, if your computer is set to 2400 bps and the modem makes a 1200 bps connection, you must use your software to change your computer rate to 1200 bps. The maximum throughput in this case is 1200 bps.

DTE

Data Terminal Equipment. Your **computer** or **terminal**. In this manual, the term computer is used to mean DTE. *See also DCE.*

Dumb Mode

Dumb mode is used in specialized situations to keep the modem from recognizing AT commands. Dumb mode is rarely needed. When shipped, the modem is "smart." When "dumb," it does not accept commands, so *the modem must be configured before being set to dumb mode.* To select dumb mode, move the jumper on the **D-S** header (on the modem board) to **D**.

Error Correction

The process of verifying the accuracy of transmitted data and retransmitting data that did not transfer succesfully.

Error Correction/ Data Compression Protocols

Protocols that increase the amount of data that can be transferred at a given connection rate (data compression) and/or improve the accuracy of transmissions (error correction). Some of these protocols are MNP 2-5, CCITT V.42, and V.42bis.

Flow Control

A buffering system that optimizes throughput by allowing your computer and connection rates to be different.

Local Modem

Your modem.

MNP

Microcom Networking Protocol. A set of protocols providing error correction (**MNP 2–4**) and 2:1 data compression (**MNP 5**). The SupraModem 2400 MNP has MNP 2-5.

Negotiation The process where you modem and the remote modem determine what type of connection to make. *Synonym:* **Detection, Detection Phase.**

Normal Connection Same as a Direct connection, but with the addition of flow control, which allows the computer and connection rates to be different. A Normal connection does not support error correction or data compression.

Online State When you can communicate with the remote computer. *See also Command State.*

Physical Protocols Protocols that describe the actual electronic signals used to communicate over phone lines. The physical protocols available on all SupraModem 2400s are Bell 103 and CCITT V.21 (300 bps), CCITT V.22 and Bell 212A (1200 bps), and CCITT V.22bis (2400 bps). *Synonym:* **Transmission Protocols.**

Reliable Connection A connection that uses one of the error correction or data compression protocols available.

Remote Modem The modem to which you connect.

Throughput Effective transfer rate. Generally speaking, on a 2400 bps connection, data will transfer at a maximum of 2400 bps, meaning maximum throughput is 2400 bps. But on a 2400 bps MNP 5 connection, where MNP 5 compresses the data to approximately half its original size, throughput can be double that of the 2400 bps connection without MNP 5, or 4800 bps maximum.

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